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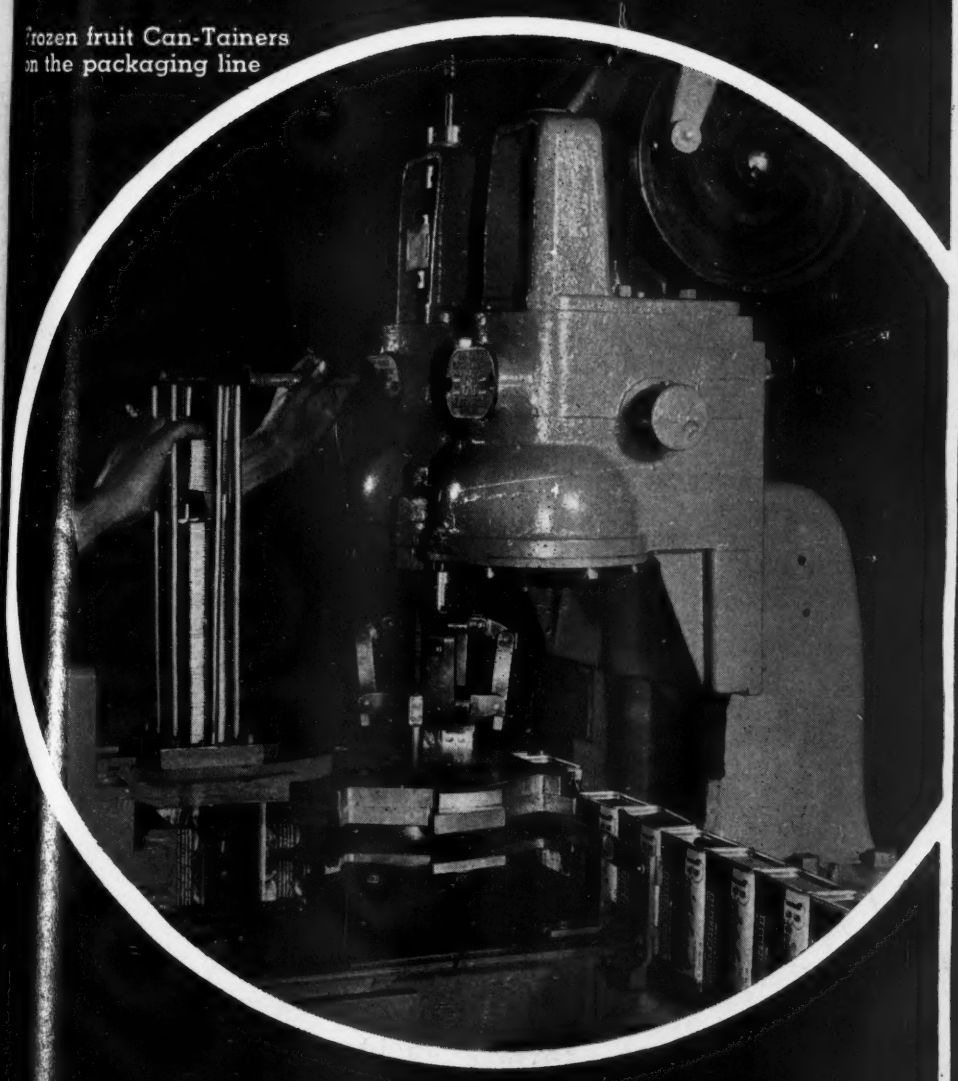
● FOR THOSE WHO CONTROL QUALITY THROUGH MANAGEMENT AND PRODUCTION



Frozen fruit Can-Tainers on the packaging line

FEBRUARY 1947

Frozen Food Report No. 2 — Part II Marketing

Soybean Lecithin In Macaroni Products

A Sanitation Program For the Food Plant

Setting Standards For Raw Materials

New Ways to Package Eviscerated Turkeys

Rapid Oxygen Test For Citrus Juices

Report on Germany's Edible Oil Industry

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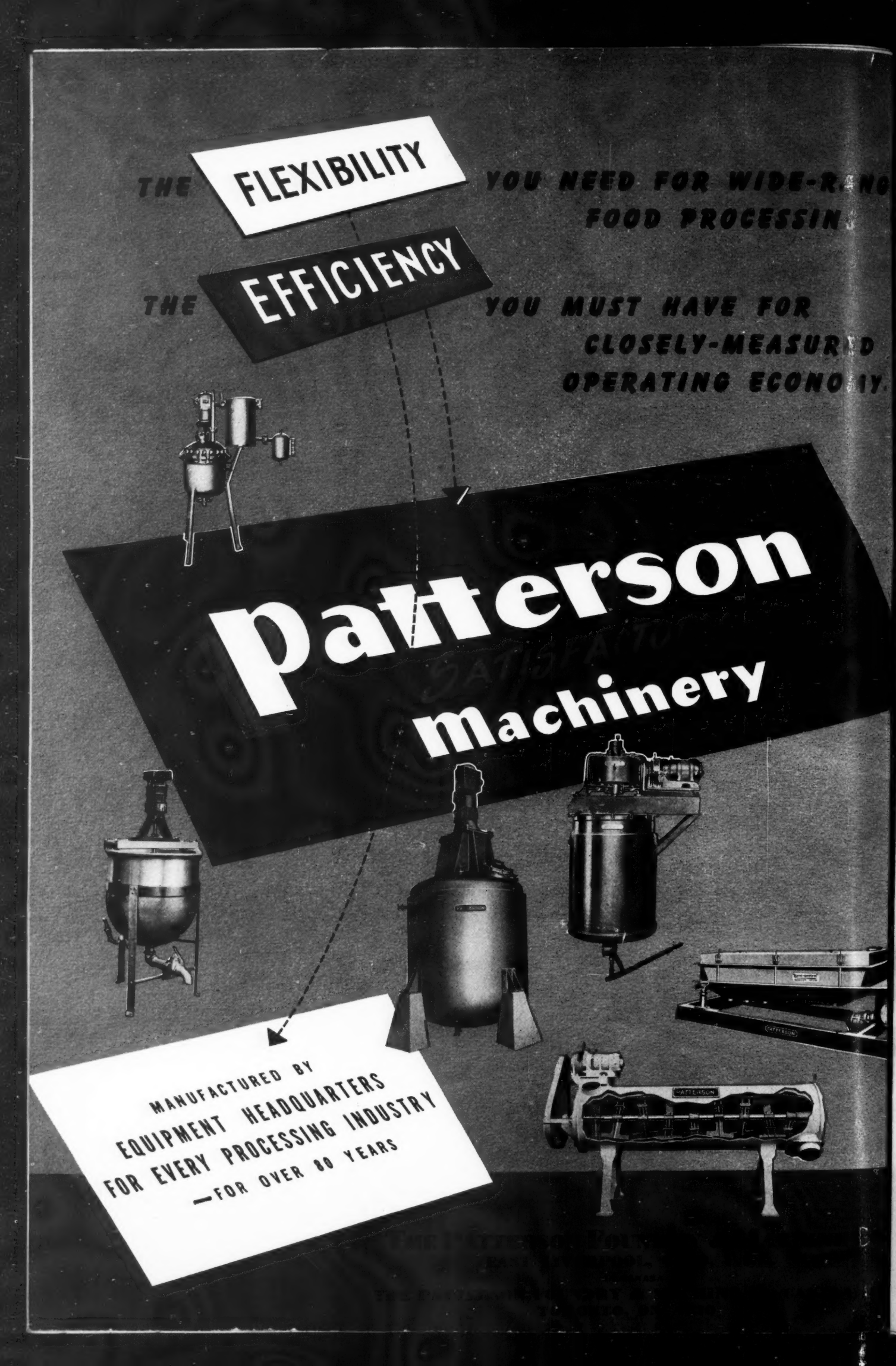
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FOR THOSE WHO CONTROL QUALITY THROUGH MANAGEMENT AND PRODUCTION

FEBRUARY, 1947 Volume 19, Number 2

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THE COVER

Bridgeford's prune plum halves are packed for freezing in Packaging Sales Company's "Can-Tainers"—new consumer-size, metal-end fiber cans. Specially designed die seam closing machine seals 60 to 75 per minute. Sealed packages are placed on trays, ready for the quick freezing rooms.

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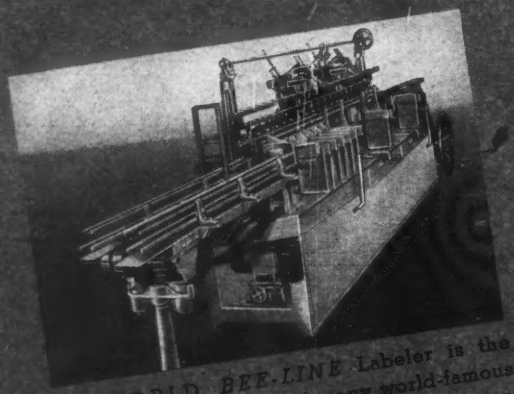

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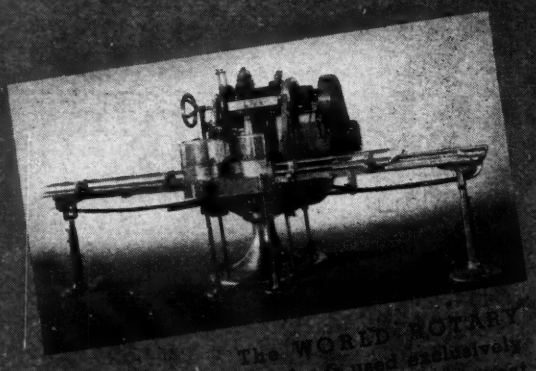

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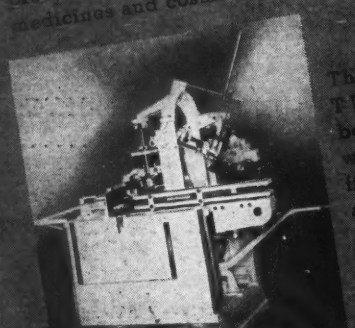
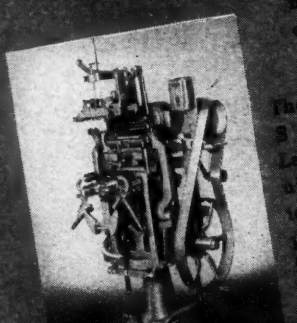


The WORLD TURRET Labeler is doing work of superfine quality for a wide variety of producers of nationally known brands.



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Lessons from "Portal to Portal"

LITTLE that can be said here will add to the reform of the 14-year old one-sided labor legislation and its background pattern of administration. That the past situation will be rectified is easily predictable: the only thing to fear is its over-correction. For, if the reform is overdone, it will merely substitute new problems—possibly even worse problems—for old ones.

While the retroactive claims for portal-to-portal overtime pay and penalties are a serious threat, it seems unlikely that all the billions claimed will ever find their way into the pockets of those who are looking for easy money. If these unwarranted claims are ever paid in full, many of the claimants may find that they have crippled their employers to the point that their jobs will have dried up. An insolvent corporation is a poor place to work—if, indeed, it can give any jobs at all.

Assuming that the Congress or the Supreme Court prevent this debacle, there is, nevertheless, sufficient merit in a few of the minor contentions to give pause to many an employer, even in the food processing industries.

Take the extreme case of one small food plant that, like Topsy, "just growed" without rhyme or reason. For some unstated reason the locker rooms and time clock remain on the third floor, whereas most of the work is on the lower floors. Workers must climb two flights of stairs, change, ring in and go down to work. At quitting time the process must be reversed. Here is a place where management should voluntarily consider the convenience of employees. While the non-working time involved is not very important, for the food plant is a small one, the existence of this form of back-tracking is an example of inefficiency that should be corrected.

A Materials Handling Problem

Speaking of back-tracking, a friend who has been revamping old plants for years, was asked what effect the current portal-to-portal business would have on factory layout and design.

"In my case, none. In many cases, however, the effect will be profound and compel extensive alterations of premises. It won't change my ways at all because for many years I have been treating the movements of employees as a materials handling problem. And that's exactly what it is: a materials handling problem.

"If I am installing a conveyor, a pipeline or a chute in any sort of a plant, I want to make it as short and as direct as possible. Years ago I recognized that the movements of employees are subject to all the economic laws of the movements of materials. That means the proper locations of entrances (and plenty of entrances), locker and wash rooms, parking lots, time clocks, and all that goes with them. There is no gain for my clients if the employees are forced to walk long distances, even on their own time. I want all their energies devoted to the productive work for which they are paid."

This concept of employee traffic as a materials handling problem is refreshingly new. Admittedly, not every concern can alter its premises at once. But there is no valid reason for deferring a study of the non-working time problem and the evolution of a plan of action where it is needed. And certainly there should be enough time clocks to eliminate any waiting in line for more than 60 seconds.

Those After Thoughts

While considering non-working time, it is the part of wisdom to plan cheerful and satisfying locker and wash rooms. All too often the planning of locker space is an after-thought that is a dismal failure. Not long ago I was in such a plant. The men's lockers were located in a narrow, crooked corridor leading to a wash room that, itself, was only half large enough. The corridor was too narrow to permit any seats or benches, men had to change clothes while others struggled past to the wash room. This condition is to be corrected, although it has existed for years. But it is only the continued growth of the company, not foresighted consideration, that has led to the projected improvement.

The whole portal-to-portal business should be a timely stimulant to active planning for improved industrial relations. It may cost money, but prevention is cheaper than cure. And continual improvement or progress toward an ideal plan has a very important psychological effect, even though the goal is not gained at once.

K. V. Burton EDITOR

The Talk of the Industry

• ISN'T it odd that criminal investigations were started just as soon as the price of butter dropped 10-cents a pound. After all the public gripes about the high cost of living —especially the high cost of butter —as soon as it took a nose dive, which one would think would be welcomed, it was the cause of several investigations. Which is not to condone any market rigging, but merely to comment on the ridiculous coincidence.

• "THE JUNGLE" by Upton Sinclair, reprinted last autumn, originally saw the light of day in 1906. It is hailed by book reviewers today, as well as then, as a potent force for good. Claims have been made that "The Jungle" compelled a cleanup of meat packing.

Not so very many years after Mr. Sinclair had done his piece on Packingtown this department worked there and knew many persons who claimed to know all about him. Their story went that Mr. S. had once notified a large meat packer that the company was about to be investigated and that Mr. S. would like a job in the plant to facilitate his investigation. The employment office of said meat packer received instructions to give him a job in the "gut shanty" where the intestines were cleaned and converted to sausage casings. Inasmuch as this occurred nearly half a century ago, it was before refrigeration was used there to hold down bacterial action in the intestines. Indeed, little was known about industrial bacteriology in that day. The shanty was not then a place for a sensitive nose. If there had been a more unpleasant job in Packingtown, Mr. S. would have been given it.

The stench was too much for him, so the story went, and after one-half day at gut cleaning, Mr. S. quit and adjourned for the next two months to a saloon at the corner of 47th Street and Ashland Avenue, Chicago. Here, it was said, he got all his information about packing houses other than his half day at actual employment. One of our informants said the boys learned they could get free beer from Mr. S. if they came up with a particularly harrowing tale.

Possibly the author may have received a somewhat concentrated dose of woes of man as a result of his willingness to buy a drink for one who could spill a good yarn.

As a tale "The Jungle" was not bad reading, but as a critic of meat packing operations at the turn of the century, Mr. S. was a good judge of side whiskers.

• "British Monopoly Planned in Co-Coa" says the headlines, referring to Britain's plans for permanent price stabilization of West African cocoa beans in Nigeria and the Gold Coast. Has it ever been otherwise? All they need to do is put the price high enough to make it worth our while to really improve certain cocoas from the Western Hemisphere. It may, however, spell the end of the 5-cent candy or chocolate bar.

• CRIES of anguish over the low prices for citrus fruits in Texas have not been unexpected. Some years ago Texas growers planted about 7,000,000 small grapefruit trees that are now coming into bearing. In a few more years the Texas citrus crop will really be something!

Brazil overdid coffee tree planting back in 1923-25 and after the crop began to come in they had to burn surplus coffee to get rid of it.

• BY present indications, the Dairyman's League Cooperative Association not only lost money on its attempt to support the butter price, but it may also lose more money defending its action, and may even be subject to a heavy fine if it is convicted of law violations.

The dairy farmers are learning the hard way that it is well nigh impossible to maintain an artificially high price on a perishable food product like butter. And maybe they are learning the hard way that dairying is a business, like any other business, and not a holy calling that is exempt from the legal restraints imposed on other forms of business.

Hors d'Oeuvres

• Velvety caramel milk, served straight from the can, hot or cold, strikes most housewives as a tasty surprise, according to Pathfinder. This development is also a tasty surprise to most of them there producers of canned milk.

• *General Mills is experimenting with a diet for roosters, which contains a small quantity of synthetic female hormone. Presto! Next thing you know you have a hensize succulent capon. But the F&DA won't approve, as yet, because they are not convinced that a male human might not assimilate the female hormone residual in the meat and thus suffer "deleterious effects." We are not sure what they mean by "deleterious effects" but we are most anxious to string along with F&DA on this proposition.*

• Chemistry in Action says that Iowa University scientists found that baby girls utter more speech sounds than do baby boys. You have just read our February short short story.

• *Rudy Vallee has a specially designed label, bearing his picture, on his champagne bottles. This is gratitude from a guy who got his start on the "Maine Stein Song."*

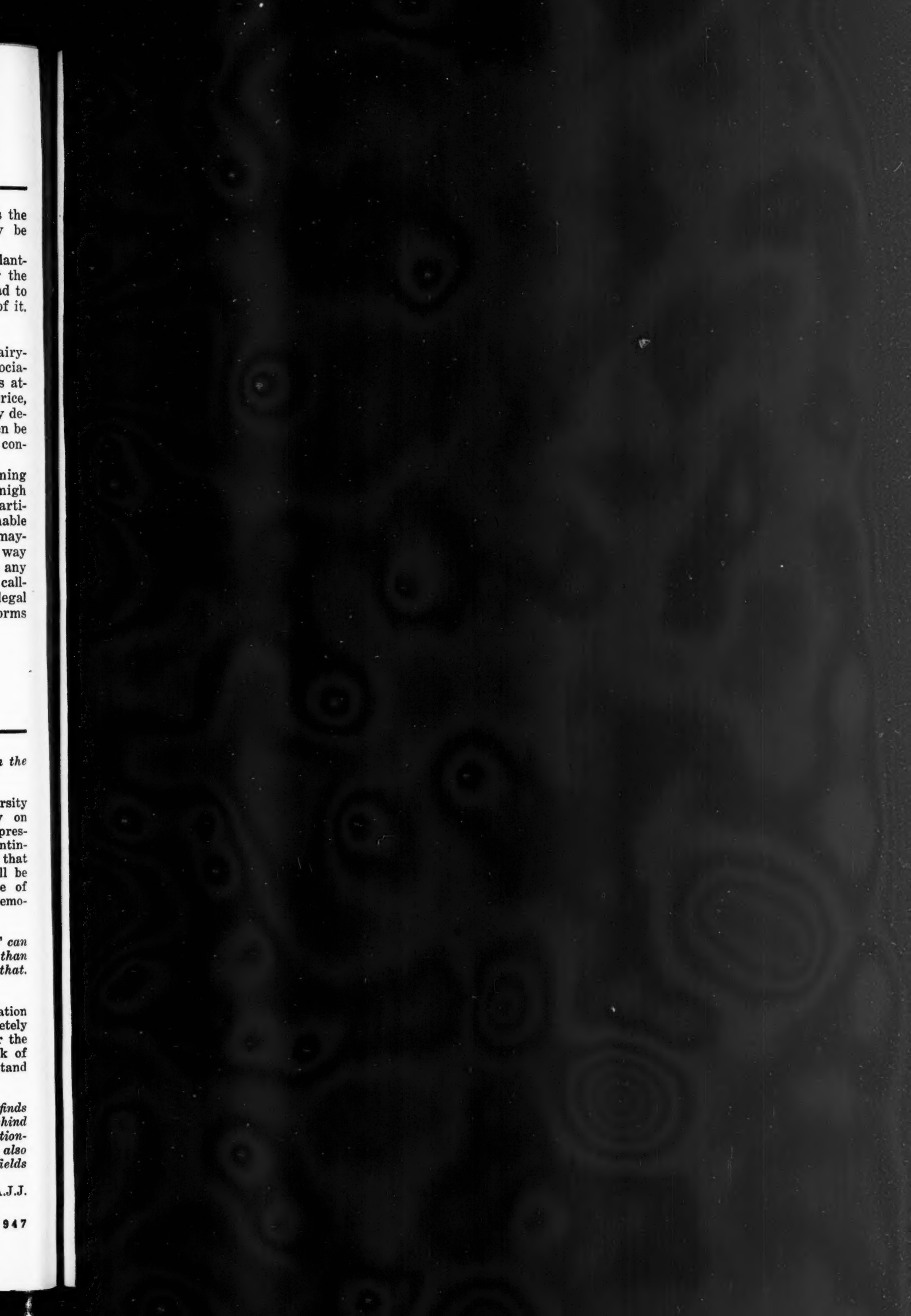
• Dr. O. E. Baker, of the University of Maryland and an authority on population trends, says: "If the present differential in birth rate continues, it is possible in a century that three quarters of the nation will be descendants of the rural people of the south." Will they all be Democrats, d'ya suppose?

• *A business bulletin says: "DDT can do more for a meat shortage than OPA ever did." Dunno about that. OPA got it pretty short.*

• The chief of the soil conservation service says that we are completely dependent on productive land for the food we eat, except fish. A hunk of terra firma is mighty handy to stand on while eating fish, too.

• *A U. S. Army technical mission finds the Germans five to ten years behind America in the field of air conditioning and refrigeration. They were also a little behind on several other fields as we remember.*

J.A.J.J.



Frozen Food Report No. 2

MARKETING

This report on marketing logically follows the review on transportation and warehousing, which appeared in these pages last month. It concludes the full report on the frozen food industry's most urgent problem—distribution

By C. R. HAVIGHORST, Associate Editor
Food Industries, San Francisco, Calif.

and

H. C. DIEHL, Director
The Refrigeration Research Foundation, Berkeley, Calif.

MARKETS have been so receptive to frozen foods that few packers have yet to experience the need of standing on their own feet, in markets, and slugging it out with competitors. The initial attitude, shown by packers towards marketing, was to follow the line of least resistance, which included stealing a ride on the one and only national advertiser's bandwagon. There was little competition during the war. OPA regulations created favorable market conditions for frozen foods and the civilian population faced food shortages, yet had dollars to spend. The resulting demand taxed the industry's production and distribution facilities to the utmost.

With the end of the war however, this industry, which now resents being called an "infant", arrived at its marketing cross-roads. One road leads to market, where brand survival becomes a matter of keen competition with other brands, and the other to mediocrity—perhaps ultimate failure.

The most formidable problem now facing the industry, therefore, is that of marketing, not of quality or quantity production. Although freezing processes are being improved and the quality of finished products refined, some packers have already demonstrated that quality is now only a matter of using good raw materials and approved processing technics. The industry has amply demonstrated its ability to expand production. But, the problems of competitive marketing of these commodities on a national or even a regional scale are comparatively unknown.

The speed with which the frozen food industry has grown, imparted to it a momentum that has carried it beyond its available low temperature distributional facilities. Such a hazardous situation, created largely through lack of industrial integration, brings this industry to a point where a careful industrial analysis concerning future expansion must be made. And, individual packers, at least, must carefully plan marketing and production programs henceforth. Mortalities among packers could be inordi-

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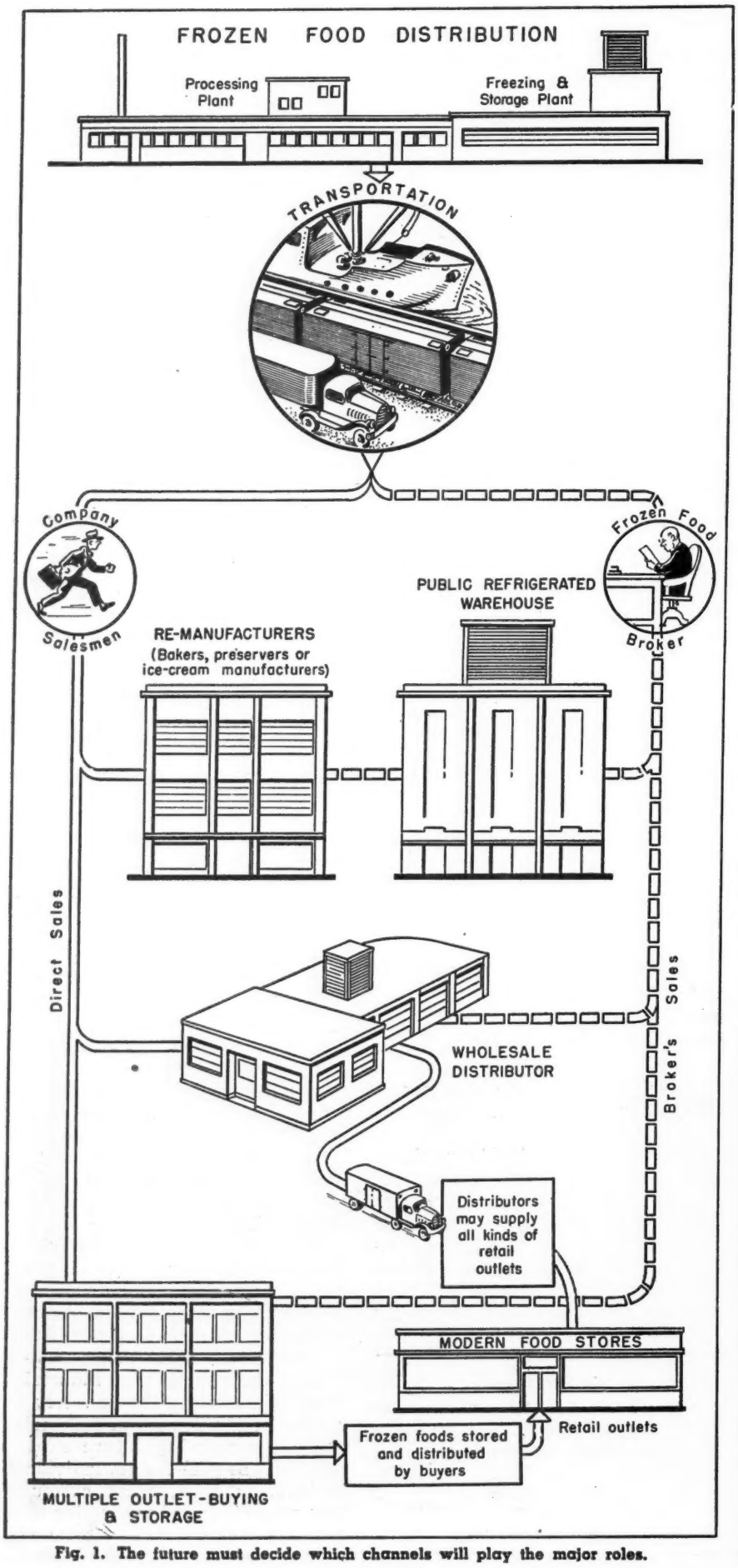

Fig. 1. The future must decide which channels will play the major roles.

nately high, in the near future, if such a course is not given consideration equal to that given to standards of quality and volume of production.

Food pipelines to markets will soon be filled again with an even flow of goods, and then frozen food marketing principles and consumer buying psychology will be put to a critical test in competition with other processed and fresh foods. There is no reason to believe that consumers and users will prefer frozen foods over all others just because they are "quick frozen." And just because a packer has enjoyed favorable reception for his brand of foods in one or several markets, without marketing effort, doesn't mean that other packers, and even other kinds of competitive foods, won't try to take those markets from him. Most packers have come to realize that their prewar marketing pattern is as obsolete as a Model T. It must be streamlined to compete in future markets.

Marketing Costs

In addition to easy accessibility, consumers and users generally give close consideration to quality and price of foods. Given competitive brands of equal quality, it is an accepted fact that the lower priced brand will receive preference. The industry's move towards mass production must include a well calculated program for mass marketing. In foods, the success of mass marketing depends to a high degree upon the price factor as well as

Marketing

The term "marketing", here, embraces all activities concerned in the exchange of goods and services for money. It includes all factors that determine or aid in the sale of these commodities and involves study and analysis of costs, prices, efficiency and effectiveness of production, production volume, packaging, transportation, refrigerated storage, wholesaling, retailing and the potential or actual reception of frozen foods by the ultimate user or consumer, as controlled through advertising and merchandising.

Market Analysis

This term consists of an individual's evaluation of the willingness and ability of a market (or group of people) to buy. It includes a survey, study and final appraisal of all marketing factors to determine the potential opportunity of the product, or brand, in a market.

Frozen Foods Have Enjoyed A Decade of Free Publicity

For its present industrial stature, the frozen food industry owes much to the national press for the free, sensational publicity given it during the past decade. In the annals of marketing there is no record of any other product, sold through retail food stores, which has received such unusual treatment. Practically every kind of national magazine and every local newspaper has published at least one article dramatizing the freshness, the natural colors and flavors of frozen foods, tempting the appetites of every potential consumer. And the amazing part of all this free publicity is that there are only a few regional advertisers and only one national frozen food advertiser. Compared with other products, sold through grocery stores, the combined advertising expenditures of all frozen food companies would probably not equal the $22,000,000 Procter and Gamble spent on advertising in 1945.

There's nothing mysterious about the helping hand from the press. This glamour girl of the food industry made good news copy. The growth potentials indicated that frozen foods would soon become as competitive in markets as are the different brands of canned foods. Here was a customer worth considerable patronage.

quality of product. The final price of these commodities reflects the accumulated costs and profits of growers, packers and all marketing functions. The production and movement to consumers of a greater volume of frozen foods should tend to reduce some of these production and marketing costs. This, when reflected in the final price, will make frozen foods more competitive, brand against brand as well as against other processed foods and fresh products. The economics of production and marketing are no longer the problem of any one individual; it can be solved only by the integrated effort of everyone concerned in the purveyance of frozen foods. The exercise of more efficient and economical practices in mass marketing of frozen foods may well result in the lowering of current costs.

For want of a better method of putting their products on markets, frozen food packers originally patterned their marketing procedure after that of canners (Fig. 1). With few exceptions, food brokers initially acted as packer's sales agents, selling their client's products largely to remanufacturers such as preservers, bakers and ice cream producers. Only a few frozen food wholesale distributors began operating when the industry first placed retail size packages on the market and their sales were severely restricted by the lack of frozen food cabinet's in retail outlets.

Adjusted Pricing

In those days of limited operations, ultimate prices were largely controlled by packers. Lacking strong competitive influences, they operated with more freedom than they are destined to have in the future. Not so much consideration was given then, as today, to the cumulative marketing costs of selling (brokerage), storage, transport, wholesaling and retailing.

Although recent wartime prices, controlled mainly by OPA, permitted maximum markups, such prices cannot be used now as criteria. They give an indication, however, as to where some future economies may be developed, when combined with the reduction in costs of other marketing functions.

If history repeats itself, the broker, having pioneered the selling of frozen foods, will find that the very client he has aided in building a business will either slash his commission to around 2 percent, or will quit him entirely, to then rely on his own company's sales force. In fact, some of the larger frozen food companies have already indicated their intention to pattern their marketing programs after that of one larger frozen food company, which has never used the services of brokers. Others have already begun to reduce brokerage commissions, which originally were 4 to 5 percent.

The reason for this change in marketing practice is mainly that some packers and their wholesale distributors find it more efficient to have direct business relations, without the so-called "middle-man" entering the picture. In addition to this, in eliminating brokers it is expected that the commissions formerly paid them will be used to help maintain a sales force and provide some money for advertising programs.

Since the maintenance of a sales force is an expensive operation, it seems that only the larger frozen food companies will find it possible to follow this course. There is no definite evidence that company selling of frozen foods is more economical than the handling of sales through brokers. But it is recognized that, through competent sales direction, a sales organization con-

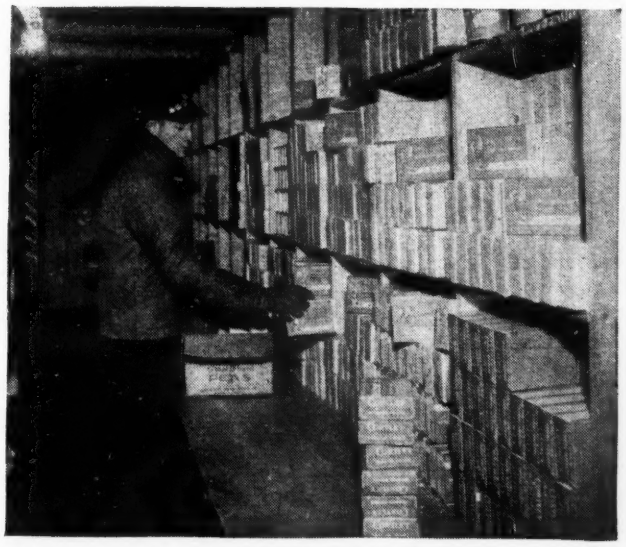

Fig. 2. For serving the New York area, Cortley Frosted Foods utilize public warehouse space. This room is kept at —7 deg. F.

Fig. 3. Many distributors, including Cortley, operate their own fleets of refrigerated trucks from public warehouses.

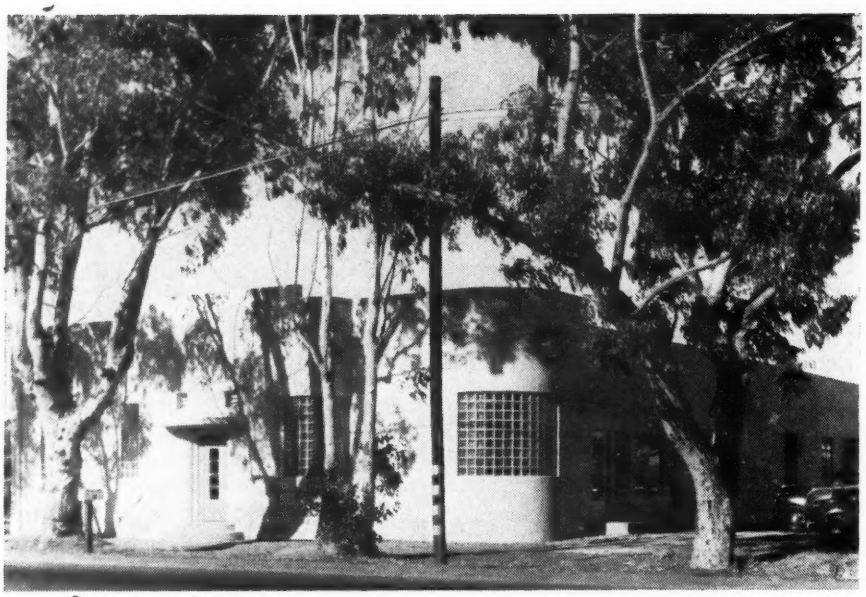

Fig. 4. Zero Isle Foods, Inc., is an example of present day locker-distributor facilities. It has 800 lockers with space for 1,000 more. This space is now used for freezer storage.

centrates its entire attention on the promotion of the company's own brands and products, whereas a broker may have to divide his time among a dozen or more. Also, better control can be maintained over storage, shipment and distribution of frozen foods through trained salesmen under personal supervision.

The value of brokers to the frozen food industry cannot be minimized. Many of them have accounted largely for the marketing success of their clients. They will always find lucrative frozen food accounts, especially among moderate size packers, who cannot afford to maintain their own sales forces. There are only a few kinds of foods and fewer brands of foods that have not been initially introduced and established by food brokers in markets. Brokers maintain that theirs is the most economical and the best method of selling since they are not paid unless they sell merchandise. Of course, those dismissed by larger packers will secure other frozen food accounts and become competitors with their former clients.

Refrigerated Storage

Until about 1944, the cost of frozen food storage, in public refrigerated warehouses, was considered as a fixed charge. It amounts, roughly, to ¼ cent per pound per month. And, since frozen foods may remain in storage for as long as 6 to 9 months, sometimes even longer, it is not unusual that an accumulated storage charge of at least 2 cents per pound is reflected in the retail price of such commodities.

The current shortage of freezer storage space, located adjacent to packers' plants and in markets, clearly indicates that the expansion of public refrigerated storage has not kept pace with the rapid growth of the frozen food industry. As of September, 1946, all freezer storage space was so congested that the USDA advised the frozen food industry of the possibility of insufficient space to accommodate the remainder of the season's pack.

Wholesale frozen food distributors have found it uneconomical and inefficient, in many instances, to use public warehouse facilities as their base of operations. They find that most of these warehouses are constructed to handle carlots of merchandise and are not geared to a distributor's operation, in which a daily movement of a number of cases of frozen commodities, instead of carlots, must be supplied to distributor's trucks. Both trucks and driver-salesmen become a liability rather than an asset if they are kept standing at the warehouse waiting to load their trucks. Besides, distributors point out that in their business, since they can provide 100 percent occupancy in freezer storage built expressly for their use, it is logical for them to build their own freezer space.

The expense of building freezer storage plants is, of course, far greater than the cost of dry warehouses. Yet, many packers and distributors reason that it is possible for them to reduce materially present storage costs by building and operating their own freezer storage plants. They figure that the cost of building such plants can be amortized within 10 or 20 years from savings earned through the difference between their storage costs and that of the public warehouses. This freezer construction trend is currently planned to provide only the amount of space needed by packers and distributors that is not now available in public warehouses. Many packers now own their own freezer storage plants and others are planning to build. Most of the larger wholesale distributors are following the same course.

As a contrast to the prevailing rates of about ¼ cent per pound per month for public freezer storage, one large distributor, with an annual volume of over 5,000,000 lb. of frozen foods, presented complete cost figures for his own freezer storage operation, which show that it now costs him only four tenths cents per pound per *year* for storage. Another estimated that his costs will average around two tenths cent per pound per month, although he had no records yet on his warehousing operation. Still another distributor mentioned that he had built his own freezer storage because it permitted savings due to more efficient operation. He mentioned that his public freezer storage costs were not significant—1.15¢ per lb. per year—and emphasized that such low costs were due to an extremely favorable contractual agreement with his public warehouse.

Transport Costs

The railroads were recently granted an increase in freight rates, including the rate on frozen foods. And certainly costs can not be reduced in face of the demand for more and better refrigerated rail cars so that transport facilities will keep pace with this industry's planned increase in production. Specific rates for refrigerated truck and marine transport are not available, but it is assumed that they will approximate rail charges or be slightly higher.

Wholesale Distribution

Most large wholesale distributors of frozen foods recognize that the OPA ceiling of 27 percent can be significantly lowered as their sales volume increases, and still provide a profitable margin for this function. Those handling a large volume of frozen foods estimate that

F.I.—T.R.R.F. 1946 Frozen Food Survey From Broker's Questionnaire

Question: Do you own or lease your business location? Do you have freezing storage facilities there? If so, what is size of storage space? (cu. ft.) How many pounds of frozen foods can be stored in this space? (lbs.) What temperature do you maintain in this space? (deg. F.)

Question: Do you rent freezing storage space from a local refrigerated warehouse?

Freezing Storage Facilities

Own	Lease	Have	Have not	Size (cu. ft.) (in 000) High	Size (cu. ft.) (in 000) Low	Capacity (lb.) (in 000) High	Capacity (lb.) (in 000) Low	Temp. °F. Low High	Rent other space Yes	Rent other space No
72%	20%	89%	11%	960	7	2000	75	—10 to 10	75%	6%

the total gross markup could be somewhere between 13 and 20 percent for this phase of retail and institutional distribution. In addition to this, there may be an opportunity for further economies, at this point, through savings accruing from distributor (and packer) owned and managed freezer storage plants.

Retailing

It is the present general consensus that the OPA ceiling of 29 percent, allowed retailers over their cost of frozen foods will remain as the accepted retail markup. Retail profit margins are usually based on volume sales and in most outlets these commodities do not sell in appreciable volume. Also in the case of frozen foods the factor of investment, cost of operation and maintenance of frozen food cabinets places an additional cost in the retail handling of these commodities. It is because of these factors that even the volume outlets, such as large supermarkets and chain stores, are expected to hold rather closely to the 29 percent margin until the cost of cabinets is retired and the sales volume of frozen foods grows to a point where retail selling prices can be appreciably reduced. However, these volume-outlet organizations may effect other economies, by packing some of their own requirements of frozen commodities and in buying, distribution and storage of frozen foods, which could be reflected in their retail selling prices without changing the retail markup significantly.

Direct Sales

Again following the merchandising pattern set by canners, it is expected that the larger frozen food packers will soon initiate direct selling to large buyers such as supermarkets, chain store organizations and independent retailer groups. The economies of such mass selling to volume buyers, in which carlots of frozen foods move into these customer's freezer storages, and thence through their retail outlets, is a necessity if the industry is to expand into mass production and marketing.

Buyers of these multiple-outlets organizations are interested mainly in food items that lend themselves to volume movement and, to gain such volume, retail prices are reduced to the lowest profitable selling price. It is therefore evident that these buyers will not be interested in the development of retail frozen food departments as long as these commodities pass through the hands of so many distributive factors, each of which adds a cumulative cost for handling.

It has been estimated that an efficient frozen food department, operated by multiple-outlet organizations, equipped with their own refrigerated storage and distributive facilities, could store all their frozen food requirements and distribute to their retail outlets at no more than 12 or 13 percent above the cost of the merchandise. The elimination of the broker's commission, wholesale distributor's gross profit margin and the savings effected by the handling of frozen foods through company owned freezer storages would show an approximate gross saving of more than 20 percent. This method of marketing frozen foods could eventually bring about a significant reduction in retail prices of these commodities. And, since price reductions will tend to make frozen foods available to a larger class of consumers, it is essential to mass marketing.

There are, of course, problems to overcome before this program becomes an actuality. The greatest need is the availability of sufficient quantity of all kinds of high quality frozen foods, and costs that will allow a profitable retail price when selling on a volume basis. The availability of frozen food cabinets and the willingness of such multiple outlets to invest in them presents a problem that should be automatically solved as consumer demand for frozen foods increases naturally or is stimulated by advertising and merchandising.

Fig. 5. Semi-portable frozen food stores, such as this, have been introduced on the West Coast. Measuring 8x11x8⅔ ft., it has 80 cu. ft. and 40 cu. ft. freezer compartments.

Assuming that the frozen food is of good quality and that it is offered at a price and under conditions that will attract the greatest number of consumers, the first step in marketing should be a study and analysis of markets to ascertain those that offer the best potential sale for the product. Frozen food market analyses must also consider the availability of freezer storage and that of wholesale and retail facilities.

Marketing Analysis

The largest expenditures made by food processors, outside of investment in plants and operation costs, are those required for the marketing functions of selling and advertising, necessary for the development of consumer demand for brands of foods. These expenditures are actually investments and are made for the purpose of increasing the sales volume of packer's brands. It is therefore obvious that a careful analysis of any market should be made to determine the potential sales volume that might be available under the impetus of an advertising and selling program. There is also the need of supporting the marketing program with a balanced supply of merchandise packed under the advertised brand.

The only available yardstick for measuring the potential sale of frozen foods in a specific market is that of the U. S. civilian annual per capita consumption of these commodities. It is questionable that per capita consumption of frozen foods is uniform throughout the U. S. or even in markets of comparable sizes. In a given area, frozen foods in retail packages consumed per capita seem to depend largely upon the effectiveness with which local distributors have operated, the number of retail outlets supplied with frozen food cabinets and whether packers have instituted selling and advertising programs in the area. The use of frozen foods by the institutional trade, (cafes, clubs, hospitals), is largely controlled by the distributor purveying frozen commodities of fair quality and competitive price. Remanufacturers, preservers, ice cream manufacturers and bakers, usually by-pass the wholesale distributor, buying from brokers, packer's salesmen or direct from the packer.

The figures for apparent civilian per capita consumption of frozen fruits and vegetables (Table I) are those available through the USDA.

This government department arrives at these figures through the following formula: To estimates on production or pack they add the beginning commercial stocks and imports, if any. This constitutes the total supply for the year. From it they subtract end-of-the-year commercial stocks, that taken by the military, and any other there might be. The remainder is considered available for civilian consumption. This residual quantity is then divided by the estimated civilian population to obtain the apparent civilian per capita disappearance for the year. The figure does not include those quantities packed by industrial users or other types of processors who use all or the largest portion of their frozen pack as raw material in their own processing activities. Neither does it include the quantities frozen in homes or in community locker plants. These

F.I.—T.R.R.F. Survey

Questionnaire replies, summarized in the tables, were part of the F.I.—T.R.R.F.—1946 Frozen Food Survey, conducted jointly by Food Industries and the Refrigeration Research Foundation. Comprehensiveness of the survey is indicated by the strategic position in the industry of the various groups who cooperated in the project. Special questionnaire forms went to:

1. **All recognized refrigerated warehouses.**
2. **Half of the locker plants.**
3. **Newspaper merchandising departments in the 137 metropolitan markets.**
4. **All frozen food distributors.**
5. **All frozen food brokers.**

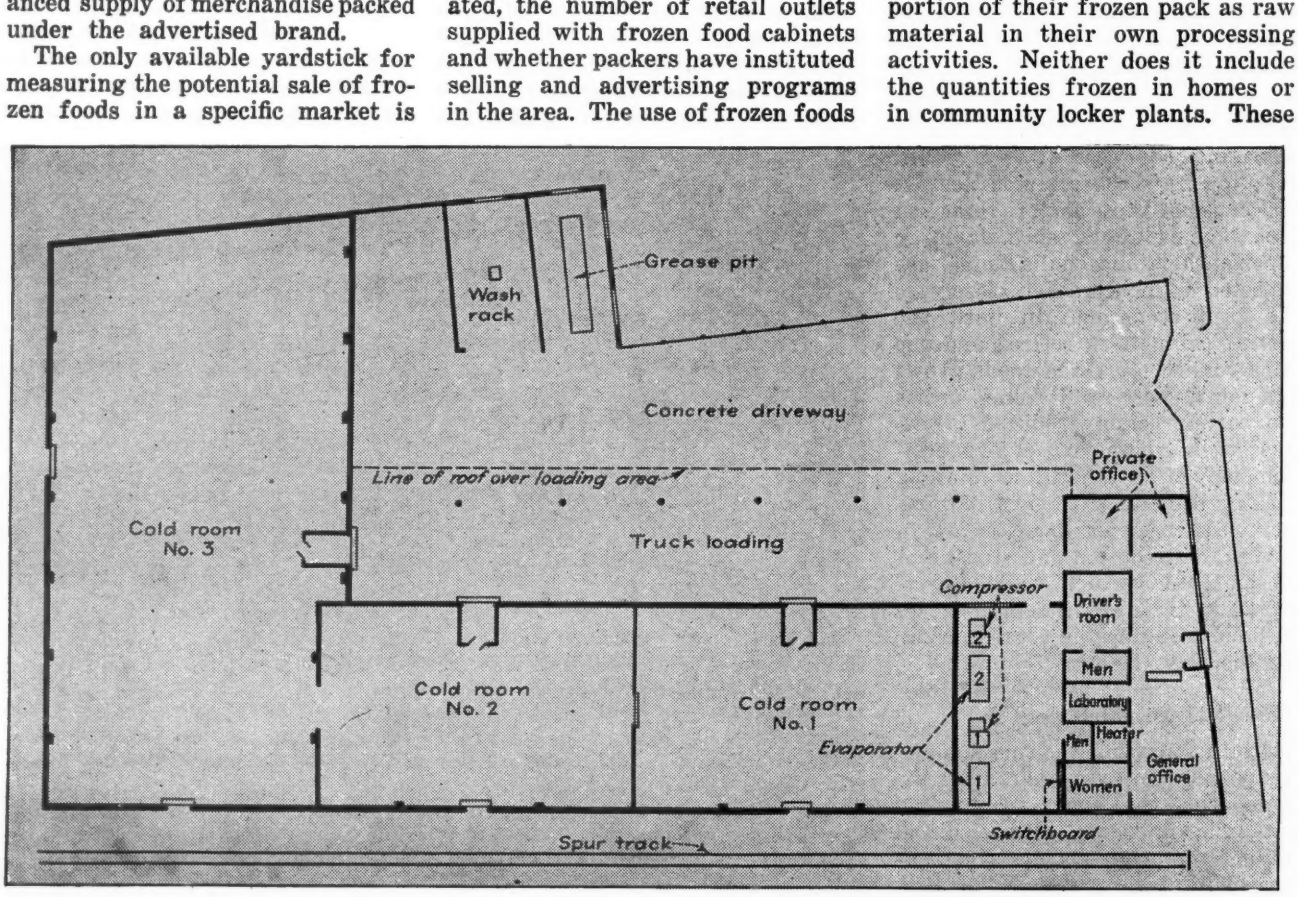

Fig. 6. This plan of Frozen Foods Distributors, Inc., pictured on page 73, illustrates an arrangement that requires a minimum of materials handling in delivering the frozen items to storage or in removing them for distribution to retail store freezer cabinets.

F.I.—T.R.R.F. 1946 Frozen Food Survey From Distributor's Questionnaire

Question: Will you list the number of brands of frozen foods which you distribute?

	Percent answering
Distributing one brand only	25.0
Distributing two brands	7.5
Distributing 3 to 5 brands	55.0
Distributing up to 14 brands	2.5

figures do include, however, those quantities that may be sold by the original packer to some other industrial user for remanufacture or use. The figures include those quantities passing through the usual channels of distribution, that is from packer to wholesaler to retailer to consumer. They also include consumption by institutions when received by them at some point in the distribution channel.

There is no doubt but that this is the only method of ascertaining the total civilian per capita consumption, in the U. S., for any kind of food. But all frozen commodities must be stored in freezer storages, and practically all of these warehouses are located in cities of 50,000 or more population. Moreover, retail and institutional customers must be serviced by frozen food distributors, and most wholesalers are located in the larger cities. Also, retail packages must be dispensed from low temperature frozen food cabinets, and it is doubtful that many rural stores have cabinets unless they are located within a wholesale distributor's delivery territory. With these points in mind it seems that the use of the entire U. S. population as a divisor for the amount of pounds of frozen fruits and vegetables available for civilian consumption would result in an abnormally low per capita consumption figure.

Because the availability of low temperature marketing facilities directs the flow of commercially packed frozen fruits and vegetables into metropolitan areas, it would seem that by using the total population found in the 137 Metropolitan Market Areas as a divisor, instead of the total U. S. civilian population, a better per capita consumption figure, for marketing purposes, could be developed, (Table II). The same base figures used by USDA for frozen fruits and vegetables that were available for civilian consumption were used to arrive at these figures.

The total population of these 137 Metropolitan County Areas (OPA Civil Population 2/15/44) is nearly 70,000,000, which represents 54.104 percent of the total U. S. populations. Total retail food sales in these markets, (S/M Estimates for 1945) were $12,414,013,000 out of the total $19,246,229,000 for the U. S., or over 64 percent.

Other Marketing Problems

The mere presence of freezer storage in a market is not sufficient evidence that this storage will efficiently accommodate all the frozen food inventory needed by the local distributor. Other frozen commodities compete for freezer space and, at peak production or marketing months, a congested storage condition might work a hardship on distributors. Frozen food packers, interested in getting their products to consumers in the best condition of quality, also should investigate the facilities offered by the warehouse, especially those concerning low temperature freezer storage and if it is so arranged that a distributor may operate from it economically and efficiently.

The packer invading a new market is likely to find it somewhat difficult to locate an established wholesale distributor not currently engaged in handling one featured brand and, perhaps, several others.

The fact that distributors are beginning to operate more like the wholesale grocers, who handle a number of brands and kinds of foods, indicates that it is possible for a packer to either displace one of these brands in favor of his own or to add his brand with others currently distributed by wholesalers. The trend is emphasized inasmuch as many wholesalers indicate that their future plans are to handle more than one brand. They maintain that this is necessary in order to operate on a sound basis.

Although this will explode some packers' theories that their distributors must handle their brands exclusively, such a move will accomplish a twofold purpose for wholesalers of frozen foods. In this manner they will be able to stock the kinds, brands and quality of frozen foods most in demand by their customers and, at the same time, will

TABLE I—Apparent U. S. Civilian Consumption of Frozen Fruits and Vegetables On a Per Capita Basis. (Total U. S. Population)

	Average 1935–39	1943	1944	1945	Prel. indication for 1946
	(in pounds)				
Fruits	.7	1.3	2.0	2.4	3.3
Vegetables	.4	.7	1.6	1.6	2.1

TABLE II—Food Industries Estimates of Apparent Frozen Fruit and Vegetable Consumption On a Per Capita Basis By Populations of the 137 Metropolitan County Areas. (Not total U. S. Population)

	1943	1944	1945	Preliminary indication for 1946
	(in pounds)			
Fruits	2.4	3.9	4.4	5.6
Vegetables	1.3	3.2	3.4	4.5

F.I.—T.R.R.F. 1946 Frozen Food Survey From Distributor's Questionnaire

Question: In your opinion, will wholesale distributors of frozen foods henceforth feature and distribute only ONE BRAND of frozen foods on an exclusive basis? (yes or no) Or will they merchandise several different brands? (yes or no).

One brand percent answering		Several brands percent answering	
Yes	No	Yes	No
27	73	93	7

Reasons for Handling One Brand Only	Reasons for Handling Several Brands
Limited display space makes competition of brands difficult.	No one packer packs a complete line. (This reason given in 50 percent of all answers.)
Facilities to handle two brands too complicated.	Can't obtain enough merchandise from one packer.
Cannot advertise several brands when retailer requests one only.	Market not settled enough to specialize on one brand.
More uniform quality of package and advertising	Too many items needed from all sources.
Distributor can do a more conscientious selling job.	More complete sales coverage.
	Cannot always guess right on year's supply.
	Various grades of certain commodities make it necessary to handle different brands.
	Distributor must handle more than one brand in order to keep up a full line and to survive in a competitive market.

F.I.—T.R.R.F. 1946 Frozen Food Survey From Distributor's Questionnaire

Question: Will you please indicate your sales volume, in pounds, for each of the seven years shown below in the following table?

Sales volume (pounds)	1940	1941	1942	1943	1944	1945	1946
			(Percent of total answering)				
Over 5,000,000	5.7	5.7	5.7	8.6	14.3	14.3	20.0
4,000,000–5,000,000	....	....	5.7	2.9	....	....	11.4
3,000,000–4,000,000	8.6	8.6	2.9	5.7	2.9	5.7	5.7
2,000,000–3,000,000	....	....	2.9	2.9	8.6	28.6	14.3
1,000,000–2,000,000	....	2.9	5.7	14.3	31.4	14.3	11.4
500,000–1,000,000	8.6	8.6	20.0	20.0	11.4	11.4	11.4
100,000– 500,000	14.3	25.7	20.0	20.0	14.3	17.1	5.7
Less than 100,000	20.0	17.1	11.4	5.7	8.6	8.6	2.9

F.I.—T.R.R.F. 1946 Frozen Food Survey From Distributor's Questionnaire

Question: What percent of your last 3 years' business volume was in retail packages?

Percent answering	1943	1944	1945
65% said	59%		
70% said		56%	
70% said			59%

10% answered retail sales comprised 100% in these years.
13% answered institutional sales comprised 100% in these years.

F.I.—T.R.R.F. 1946 Frozen Food Survey From Distributor's Questionnaire

Question: Will you list the brand names of all frozen foods that are now being advertised in your territory? What advertising media are used to advertise these brands?

		Once mentioned brands
Birds Eye	27 times	Frozest
Honor Brand	8 "	Whiz Dinners
Dulaney	6 "	Frostar
Polar	6 "	Cortley
PictSweet	5 "	Sterling Point
Booth	4 "	GIC
Paragon	3 "	Sun Valley
Agen	3 "	Little America
Fairmont	2 "	Cedargreen
All the rest	1 time only.	

Of these brands, the number and advertising medium used in each region are shown below:

Region	Newspaper	Magazine	Radio	Other
New England	4	3	1	0
Middle Atlantic	12	4	5	4
E. N. Central	5	2	5	5
W. N. Central	0	2	1	0
South Atlantic	2	1	1	2
E. S. Central	0	1	1	0
W. S. Central	3	2	2	3
Mountain	0	1	1	1
Pacific	5	2	4	4

place themselves in a position where the loss of a segment of their sales volume occasioned by direct selling by packers will not force them to the wall.

Early Distribution

The pioneer frozen food distributor usually operated out of a public refrigerated warehouse. He used poorly insulated or entirely uninsulated trucks for delivery purposes and only the most tenacious survived the ordeal of introducing this new kind of processed food. Most represented one packer exclusively, usually due to restrictions placed on him by his source of supply. But, the business of wholesale distribution of frozen foods has been growing in the same manner as the industry it serves until, today, some distributors do more than $1,000,000 in annual gross sales.

Most frozen food packers realize that their most profitable retail volume business, today, flows through the hands of wholesale frozen food distributors. None of the largest chain store corporations has begun concentrated merchandising of frozen foods, although they are expected to do so in the near future. Several of the larger independent retail grocers' groups have begun to promote the sale of frozen foods. Not wanting to change horses in midstream, it is essential that packers continue to direct their retail pack through distributors.

Because packer-distributor contractual relations are usually of one-year duration, plans for the invasion of new markets should be made a year in advance, unless it is proposed to establish entirely new distributors. This same range in planning is advantageous in the matter of securing refrigerated warehouse facilities.

In most markets today, a new distributor has considerable missionary work to do before he has developed sufficient sales volume to make his business a profitable one. Retail and institutional buyers are accustomed to buying from established distributors and usually these customers are acquainted with and have developed some brand preferences. Distributors also face the retail bottleneck—a condition caused by the lack of frozen food cabinets in retail stores. Currently, established distributors endeavor to keep all existing retail cabinets full of frozen foods, not only so that consumers may find enough of all kinds of frozen commodities but, also, in order that a newcomer into this business will find it difficult to convince a retailer that there is sufficient space in the cabinet for another brand of frozen foods. Advertising competition has already begun in these markets, judging from the number of brands currently advertised.

Following the pattern most uniformly used in preparing a market for a food advertising program, most packers have employed specialty salesmen, under direct company supervision or that of the company's broker, assisted by the distributor's driver-salesmen to initially introduce brands to retail and institutional buyers. Sufficient distribution among the better class retail stores of a city or area is necessary before starting an advertising program.

Locker Patrons

Consumers become locker patrons because it is the most economical and best method of preserving the best foods available, usually from nearby sources. From the standpoint of economy it seems that commercial packers of frozen foods would find this market more receptive to their commodities if they were packaged in special bulk locker packs. There is no need for the small retail packages in this market because, in principle, the patron buys and stores foods in bulk. This type of locker-pack will not present much of a problem for the loose-frozen commodities. Fruits frozen in sirup, however, and vegetables such as the leafy or flowered varieties, will be somewhat more difficult to package in bulk and still be readily dispensed in smaller quantities.

Texas Provides a SAMPLE AREA For MARKET ANALYSIS

AN important use of the maps and data of this 1947 report lies in their application to broad industry planning and a closer integration of frozen food production with all distributional and marketing functions including transportation, refrigerated warehousing, distributing and selling.

At one time it was a simple matter for railroads to transport, for public refrigerated warehouses to store, and for distributors to sell all that the industry could produce. With the exception of that part of the pack destined for remanufacturer uses, the main problems then were to find wholesale distributors and to find or provide low temperature storage cabinets in retail outlets. But the rapid expansion of frozen foods production, especially in 1945, was not entirely in balance with marketing facilities nor; perhaps, with the ability of users to consume enough of this year's pack so as to avoid a carry-over. Of course, in the history of this industry there have been other carry-overs and there were many factors, other than just over-production that contributed to this one. Nevertheless, in this condition, there is evidence that the industry must evaluate marketing facilities and potentials and then integrate production with these factors. The same applies to individual frozen food packers.

This might be termed a problem in marketing mechanics—that of getting a balanced supply of frozen foods to users. Gradually, as the industry becomes more closely integrated, and marketing facilities become available in all potential markets and even in retail outlets, these imbalances may be relatively unimportant. Although currently serious, they are of temporary nature and will not continue to be a constant plague to the individual frozen food packer as will the keen competition of marketing a brand of frozen foods.

It is not the purpose of this report to set forth the markets that should be considered in individual packer's marketing programs. Nor does it presume to delineate principal frozen food trading centers from which, because they have all the necessary low temperature marketing facilities, a large surrounding area could be served. In all marketing phases, the industry is so young that there has not been time to develop more than a portion of the 137 metropolitan county areas, which have been available because they offered marketing facilities. And it will be some time before large trading areas, such as are now established for other food marketing, can be discerned in the gradual expansion of frozen food distribution. However, in order that the industry's potential expansion may be successfully consummated, detailed consideration must be given by packers to means and methods of regional and national marketing programs.

An analysis of the Dallas-Ft. Worth Frozen Food Trading Area (Table III) when combined with data taken from the tabulations found on the reverse sides of Maps 1 and 2 and Table II, represents the first step in making an analysis of this market. Other markets may be studied in a similar manner.

The sample of the Dallas, Tex. territory, because of its size, makes markets and marketing facilities immediately discernible (Fig. 7). In this trading area, as in any other in the country, it is impossible to present every factor that has a bearing on marketing frozen foods. Much of such information is available to frozen food marketers through local newspapers, food brokers and frozen food distributors. Since little is known on the subject, other than the apparent per capita consumption of frozen foods, it is suggested that individual consideration be given in market studies to the classes of buyers, their ability and desire to purchase frozen foods and the low temperature facilities available for this purpose. During the past few years nearly every class of buyer has been able and willing to buy these commodities. Nevertheless, such problems as the ability and buying habits of the negro population of Texas, as an example, which comprises nearly one-sixth of the total of this state, must be considered in a market analysis. The amount to be spent in advertising and the selection of media are also matters to be individually decided. Therefore, this sample is presented only as a guide to the various applications that can be made of these data.

A packer, who is just beginning

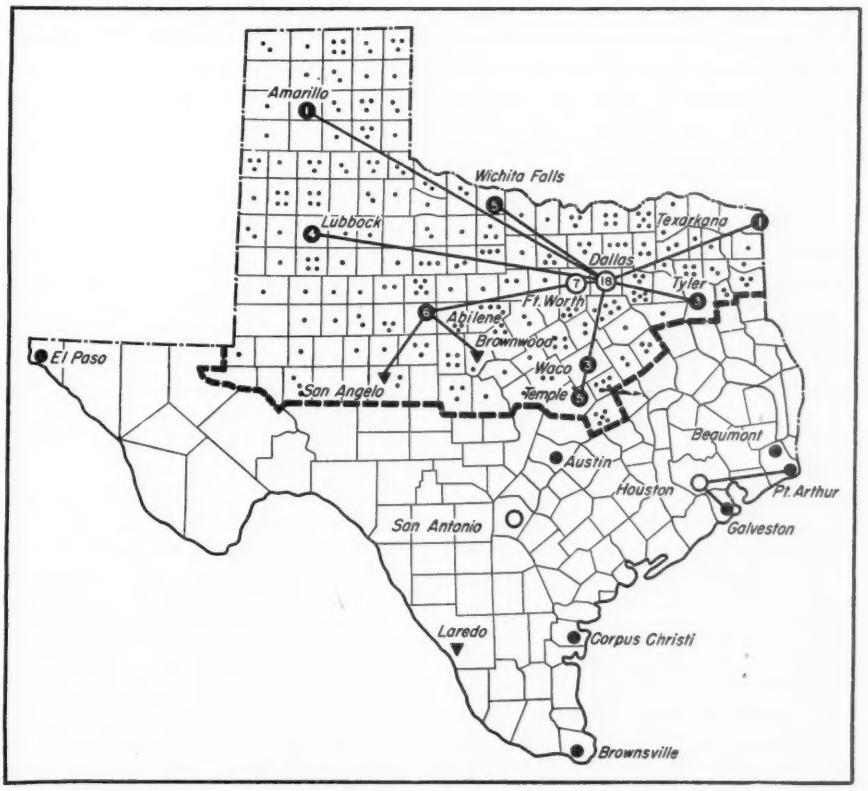

Fig. 7. Here are the main and subsidiary centers of the Dallas-Ft. Worth market. Numerals indicate number of locker plants in city areas; dots, those in counties.

TABLE III—Proposed Dallas—Ft. Worth Frozen Food Trading Area

Cities	Metropolitan Cities Within Area: Pop. in 1,000's	Yearly food sales (R't'l) in $1,000's	Potential frozen fruit & veg. consumption (1000's lb.) F/I*	Marketing Facilities Available in These Cities: Public reefer w'hse net space available (cu. ft.)	Other kinds of reefer w'hses: P	SP	F	Pr	M	Locker plants in cities or in counties: City	County	Frozen food wholesale distributor in cities
Dallas	398.6	53,217	3,099.1	2,303,000	X		X		X		18	X
Ft. Worth	230.0	32,635	1,774.0		X		X		X		7	X
Temple	25.5	3,208	198.9							2	3	
Waco	66.0	9,468	514.8	8,000	X				X	2	1	
Abilene	34.0	5,484	265.2							3	3	X
Brownwood	26.0	2,783	202.8							1		
San Angelo	31.7	5,784	247.3				X			2		
Lubbock	43.1	6,933	335.2		X					3	1	
Amarillo	59.3	9,913	462.5			X				2		
Wichita Falls	52.0	7,678	405.6							3	2	
Texarkana	26.0	3,425	202.8		X						1	
Tyler	33.0	6,043	257.4		X					2	1	
Totals for trading area..	1,025.2	146,671	7,965.6							—287—		

* Additional information available through newspapers, brokers and wholesale frozen food distributors located in this Trading Area:
Dallas-Ft. Worth
In these two cities there are 5 wholesale frozen food distributors selling 4 featured brands of frozen foods (Birdseye, Booth, Honor Brand and California Consumers Corp.), although there are several other brands on this market handled by these and other distributors.
Birdseye, Honor Brand and Booth are the advertised brands in these cities with two of these using newspaper and radio media and one using newspaper only. All three employ some point-of-sale advertising.
Refer to Table VII, Part I, for information regarding the kinds of frozen foods produced in or adjacent to this region which might offer competition to a new brand entering this trading area.

to establish his brand of frozen foods in a new market, would first begin his selling and merchandising program in the principal city of a metropolitan county marketing area. After securing fair distribution in the city, he would then expand it through the entire county area. Thereafter it would be a slow process of developing an entire trading area.

Market Potentials

With the addition of such information as the individual finds necessary, it is possible to determine, with this material, the market potentials of (1) the metropolitan cities, (2) metropolitan county area and (3) rural areas. Population figures of these three kinds of markets combined with the yearly retail food sales allow for comparisons of new markets with those in which packers now have distribution of their brands of frozen foods. Potential consumption of frozen fruits and vegetables (Table II) gives an idea of the amount of these commodities that may be sold in these markets under a vigorous marketing program.

Low temperature storage facilities are located in all of these markets (either public or other kinds of refrigerated warehouses or locker plants), and there are currently five wholesale distributors operating in the trading area center (Dallas-Ft. Worth). Evidence that frozen food marketing competition is growing in this area is shown in the fact that currently four brands are being advertised.

No consideration has been given to the rural portions of this trading area. The University of Texas, bureau of business research, reports, however, that there are some 287 locker plants in this region. If these plants have an average of 500 lockers each, it would mean a potential market of some 143,500 families—largely in the rural area but including those located in the metropolitan markets—that now have freezer storage available in locker plants. Since there are no specific per capita consumption figures of commercially packed frozen foods for locker patrons, it is difficult to evaluate a potential sales volume that might be available from this source. However, since the USDA apparent frozen food per capita consumption figures were based upon both metropolitan and rural (all) civilian population of the U. S. (Table I), these figures could be used, with reservations, as an indication of what quantity of commercially packed frozen foods rural locker patrons might consume.

The matter of thorough distribution throughout this area must be, of course, developed. It is obvious that the marketing of frozen foods in smaller towns and rural areas presents current problems of significant magnitude. However, here is the potential frozen food market.

Marketing Map and Data

The Metropolitan County Areas, portrayed on the Frozen Food Marketing Map, account for nearly 64 percent of the U. S. total civilian population and for over 73 percent of the estimated retail food sales of 1945 (Sales Management Magazine Estimate). Although, in connection with this survey, this material is intended for use by the frozen food industry and its allied branches, it is of equal value to any other food manufacturer in checking markets.

Other uses to which this material may be put are:

1. Correlating frozen food production with the absorptive ability of markets.
2. As a means of selecting the most efficient, economical and safe mode of refrigeration.
3. To determine the availability of freezer storage facilities in or adjacent to markets and in rural areas.
4. To evaluate the need for freezer storage facilities in producing regions or in markets.
5. To determine and set salesmen's quotas.
6. To evaluate the efficiency of brokers' selling.
7. As an aid in allocating sales budgets.
8. As an aid in the selection of test markets in which proposed marketing programs will be tried experimentally.
9. Planning marketing expansion programs.
10. As a yardstick to determine sales progress or retrogression in specific cities, metropolitan county areas or on a national scale.
11. To determine, through comparison of data, the efficiency of present wholesale distributors and to set requirements for them and for new distributors, such as, number and kinds of refrigerated trucks; whether distributors should own and operate their own freezer storage warehouse; and to determine maximum per capita sales for specific products.
12. To aid in determining the effectiveness of present advertising and to plan new programs.
13. To allocate advertising expenditures on a national scale, or on a metropolitan county, city or rural basis.

The key to RURAL MARKETS is THE LOCKER PLANT

FEW packers, or distributors, have been inclined to begin a marketing, or distribution, program in the smaller towns and rural areas through locker plants, with demand firm for frozen foods in metropolitan areas. It is in the rural areas, however, where 46 percent of the total U. S. population resides and where 36 percent of all retail food sales are found. There are admittedly many problems to be solved—mainly those concerning the development of a reasonable sales volume—before this market can be opened effectively. In areas where locker plants are heavily concentrated, distribution of commercially packed frozen foods should be currently profitable. There is definite assurance that frozen food packers will eventually find this entire market of value.

Locker plants are located either in or near small towns. Because they have freezer storage facilities, they are in a natural position to handle commercially packed frozen foods. For the same reason, larger locker plants, which are located in producing regions, will become competitors of the commercial packer by packing a line of locally grown or produced products. Such packs for the most part will be offered for sale in the near vicinity of the locker plant, although several lockermen have expanded their original businesses into full-fledged frozen food packing operations.

This branch of the industry is growing so rapidly that it is almost impossible to keep data current on this subject. Information, released August 16, 1946, shows that there were then 8,025 locker plants in the U. S. (Table IV).

This source estimates that there are currently 3,250,000 lockers in these 8,025 plants, which store almost 1,250,000,000 lb. of foods annually for some 2,250,000 families, 75 percent of whom are farmers. Current estimates place 500 as the average number of lockers in all the plants of the U. S. A further breakdown indicates that most plants (over 50 percent) have "up to" 500 lockers.

The locker plant that has a freezer storage room is ideally equipped to handle the sale and, perhaps, the distribution of commercially packed frozen foods to retail outlets in the surrounding territory. Those plants not so equipped will, in all probability, have to stock frozen foods in cabinets in their display room. Since only a few plants now have cabinets it is quite probable that manufacturers of this low temperature equipment will find this a valuable market.

Locker plant patrons and especially those of plants located in agricultural districts producing foods that lend themselves to quality and quantity freezing, may not

F.I.—T.R.R.F. 1946 Frozen Food Survey From Locker Operator's Questionnaire

Question: Do you stock and sell commercially frozen foods? If not, do you plan to do so?

	Percent answering
Yes	46
No	54

Plan to stock and sell—58% of those answering No.

F.I.—T.R.R.F. 1946 Frozen Food Survey From Locker Operator's Questionnaire

Question: How many lockers, of all sizes, do you have available to customers?

Up to 500	53%	1000 to 2000	11%
500 to 1000	33%	Over 2000	3%

(One third of the lockermen answering the above question stated that they also had additional rooms, not equipped with lockers, that were used for freezer storage.)

F.I.—T.R.R.F. 1946 Frozen Food Survey From Locker Operator's Questionnaire

Question: In your display room do you have cabinets from which to sell frozen foods?

	Yes	No
Display type	10%	77%
Nondisplay type	13%	

(Sixty-three percent of the lockermen answering the above question stated that they plan to sell home-freezing and storage cabinets when this equipment becomes available).

TABLE IV—Frozen Food Locker Plants in the U. S.
Ninth Annual Count
USDA Extension Service

	1946	1945	1944	1943	1942	1941	1940	1939	1938
Total number of plants	8,025	6,464	5,282	4,559	4,323	3,623	2,870	1,861	1,269
Increase from previous year	1,561	1,182	723	236	700	753	1,009	592	.....

July 1946 count of locker plants by States:

	1946	1945		1946	1945		1946	1945
Alabama	49	35	Maine	5	3	Ohio	288	223
Arizona	17	9	Maryland	29	23	Oklahoma	299	150
Arkansas	75	55	Massachusetts	22	14	Oregon	325	300
California	438	299	Michigan	232	145	Pennsylvania	184	145
Colorado	135	99	Minnesota	525	477	Rhode Island	5	4
Connecticut	50	20	Mississippi	78	61	So. Carolina	36	17
Delaware	6	6	Missouri	229	165	So. Dakota	315	289
Florida	14	11	Montana	159	120	Tennessee	89	59
Georgia	101	49	Nebraska	345	294	Texas	402	260
Idaho	160	149	Nevada	7	3	Utah	97	66
Illinois	450	371	New Hampshire	26	18	Vermont	35	31
Indiana	213	140	New Jersey	12	10	Virginia	29	25
Iowa	655	600	New Mexico	32	19	Washington	495	450
Kansas	340	315	New York	165	155	W. Virginia	8	2
Kentucky	60	52	No. Carolina	45	25	Wisconsin	473	473
Louisiana	25	17	No. Dakota	185	165	Wyoming	61	46

F.I.—T.R.R.F. 1946 Frozen Food Survey From Locker Operator's Questionnaire

Question: Do you *now* distribute or *plan* to distribute frozen foods to any of the following?

Homes		Institutional Trade		Retail Stores	
Now	6%	Now	5%	Now	3%
Plan to	18%	Plan to	19%	Plan to	20%

F.I.—T.R.R.F. 1946 Frozen Food Survey From Locker Operator's Questionnaire

Question: At what temperature do you maintain your locker rooms?

	Percent answering
Above 5 to 15 deg. F.	19
Approximately 0 deg. F.	72
Below −5 to −10 deg. F.	9

F.I.—T.R.R.F. 1946 Frozen Food Survey From Locker Operator's Questionnaire

Question: Do you operate another kind of business in addition to your locker plant? If so, what other kind of business?

	Percent answering
No other business	29
Retail food—meat, groceries	33
Cold storage, ice, fuel	11*
Produce, poultry, cream	8
Food processing or wholesale	7
Appliances	4
Miscellaneous	8

* Five percent of these were large cold storage plants of 100,000 cu. ft. or more space.

ACKNOWLEDGEMENTS

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E. P. Hawk ..... **Foodstuffs, Fats and Oils Section, Industry Division, Office of Domestic Commerce, U. S. Dept. of Commerce**

The National Association of Wholesale Distributors.

become consumers of all kinds of commercially frozen foods. However, they are potential buyers of those products not native to the regions in which they are located. The fact that there is a locker plant, with an average of 500 lockers, for every 750 to 800 farms in the U. S., along with the record that the number of plants is increasing at the rate of around 20 percent per year, shows that the locker industry is of significant size and represents a growing market for frozen food packers and equipment, machine and material manufacturers.

Basic Facilities

As related to the potential mass marketing of commercially packed frozen foods, the locker plant market is of interest, primarily, because it has the basic facilities for freezer storage of these commodities in districts that are usually remote from metropolitan areas and which are served by commercial cold storage plants or wholesale distributors.

Other Factors

Of secondary importance is the fact that locker patrons being admittedly interested in freezing foods and storing them for individual consumption, should become potential buyers of frozen commodities not available in the regions surrounding each locker plant. Other factors, aside from these, are of importance in connection with the sale of commercially frozen foods through the locker plant market. While most of these outlets plan to stock frozen commodities only for their own patrons, a significant percentage will become wholesale distributors.

Locker plants are widely varied in type—ranging from those that provide only lockers for patrons to those that provide a wide variety of services, such as food preparation and packaging facilities, butchering service, chill rooms, curing and wrapping and pickling. A rather wide range of temperatures are prevalent in locker plants although most offer approximately 0 deg. F.

Locally grown meats and poultry are, by far, the items stored in largest quantities, but substantial quantities of fruits, vegetables, fish and game are kept in lockers. Nearly all lockermen indicate that they provide some food preservation services in addition to locker storage for foods.

Rural Consumption

The only yardstick with which to measure the potential per capita consumption of frozen fruits and vegetables in this rural market are the figures for apparent civilian consumption of these commodities prepared by the USDA (Table I). It will be essential to weight these figures, when they are used for regions in which fruits and vegetables are available, in order to arrive at a probable per capita consumption figure.

This rapid expansion of locker plants is opening a new field for food merchandising. It also offers opportunity for marketing refrigeration and other types of machines and equipment. While a large proportion of lockermen are engaged in no other business, 17 percent report multiple-locker plant operations and others operate a diversified business.

Frozen Food "Complete Package"

Following the publication of Frozen Food Report No. 2 in Food Industries, there will be available a "complete package" of reprints on the frozen food industry. It will contain:

1—Transportation and Warehousing, and Distributional Facilities Map.

2—Marketing of Frozen Foods, and Marketing Areas Map.

3—New Frozen Food Directory, Directories on Packers and Distributors (February, 1947, edition).

4—Report on Frozen Foods (Production—published March, 1945).

5—"So You Are Going Into Freezing" (Production & Distribution checklist).

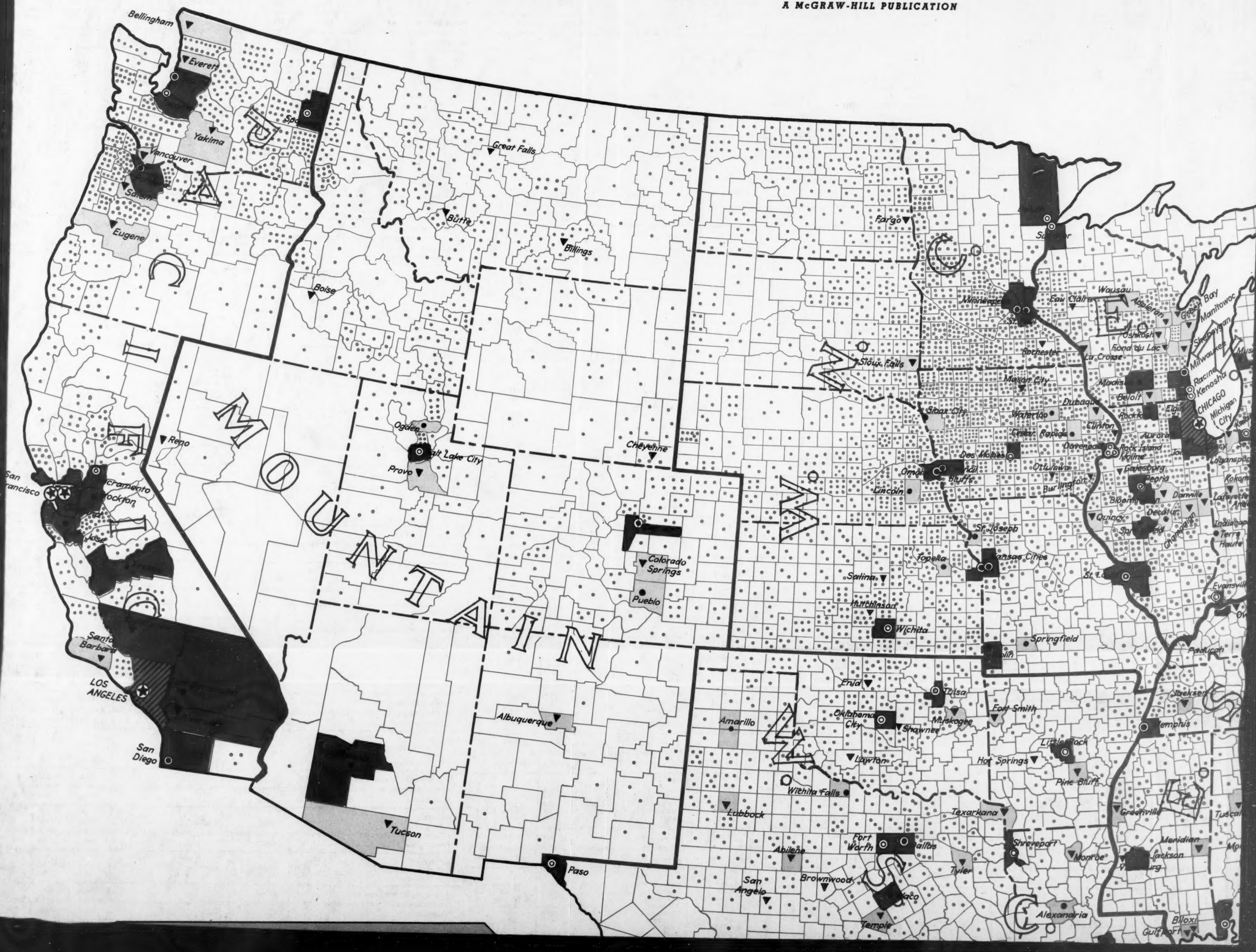
The complete package will sell for $3.00 each (10 or more, $2.50 each).

FROZEN FOOD MARKETING A

OF THE UNITED STATES

Prepared by FOOD INDUSTRIES · Map Number 2

A McGRAW-HILL PUBLICATION

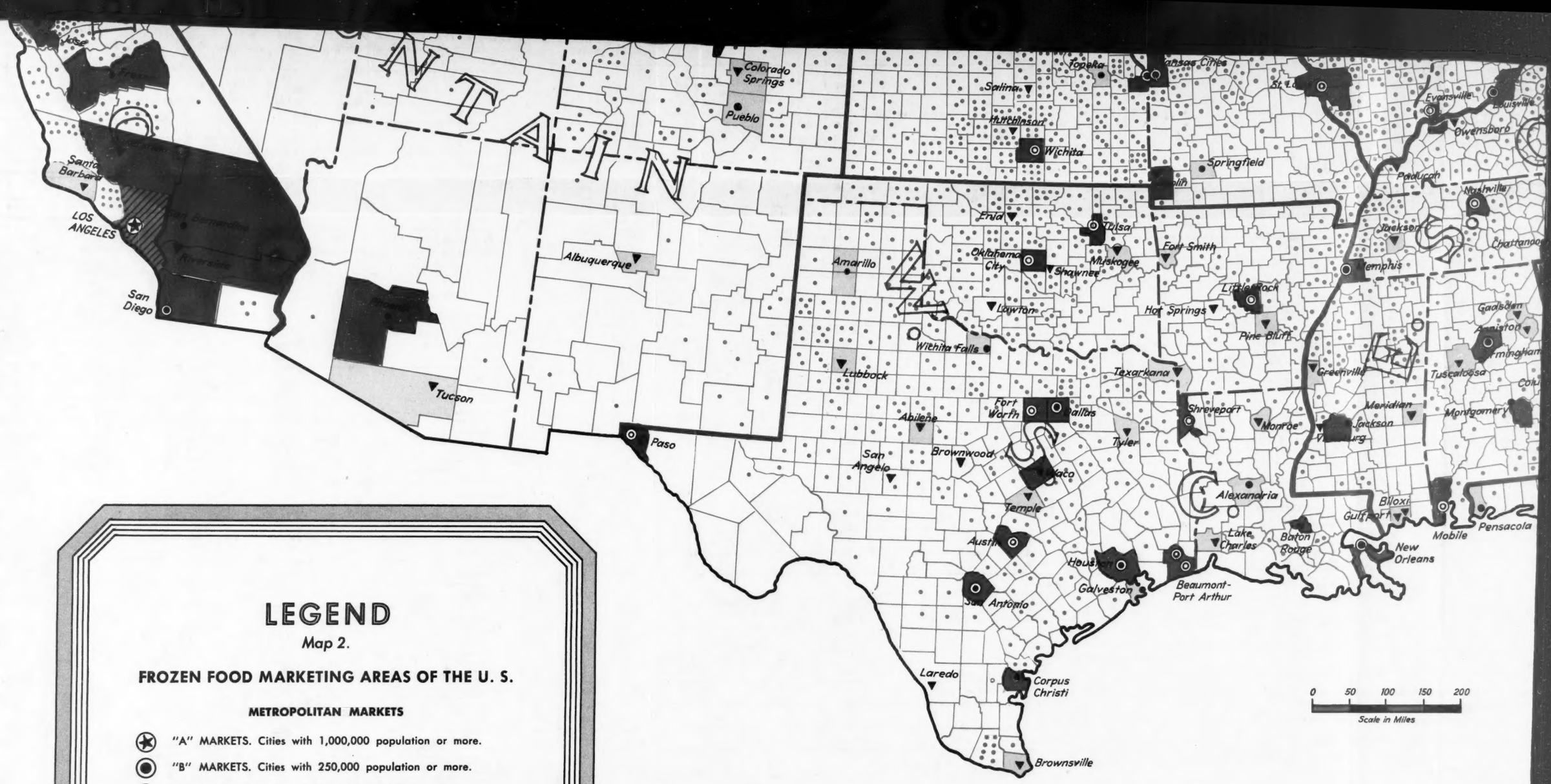


N FOOD MARKETING AREAS

OF THE UNITED STATES

Prepared by FOOD INDUSTRIES · Map Number 2

A McGRAW-HILL PUBLICATION



LEGEND

Map 2.

FROZEN FOOD MARKETING AREAS OF THE U. S.

METROPOLITAN MARKETS

- "A" MARKETS. Cities with 1,000,000 population or more.
- "B" MARKETS. Cities with 250,000 population or more.
- "C" MARKETS. Cities with 100,000 population or more.
- "D" MARKETS. Cities with 50,000 population or more.
- "E" MARKETS. Cities with 25,000 population or more.

COUNTIES COMPRISING METROPOLITAN MARKET AREAS

- Market Areas (by counties) with 2,000,000 population or more.
- Market Areas (by counties) with 250,000 population or more.
- Market Areas (by counties) with 100,000 population or more.
- Market Areas (by counties) with 50,000 population or more.
- Locker Plants.
- U.S. Bureau of Census Regions.
- State Boundaries
- County Boundaries

DATA FOR INDIV

Markets are shown on this map in two ways. Metropolitan city populations are indicated by symbols, and metropolitan county marketing area populations by colors. Population data for city and county areas are given in the tables on the reverse side of the map. Thus it is possible to undertake a stu
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A marketing sample,
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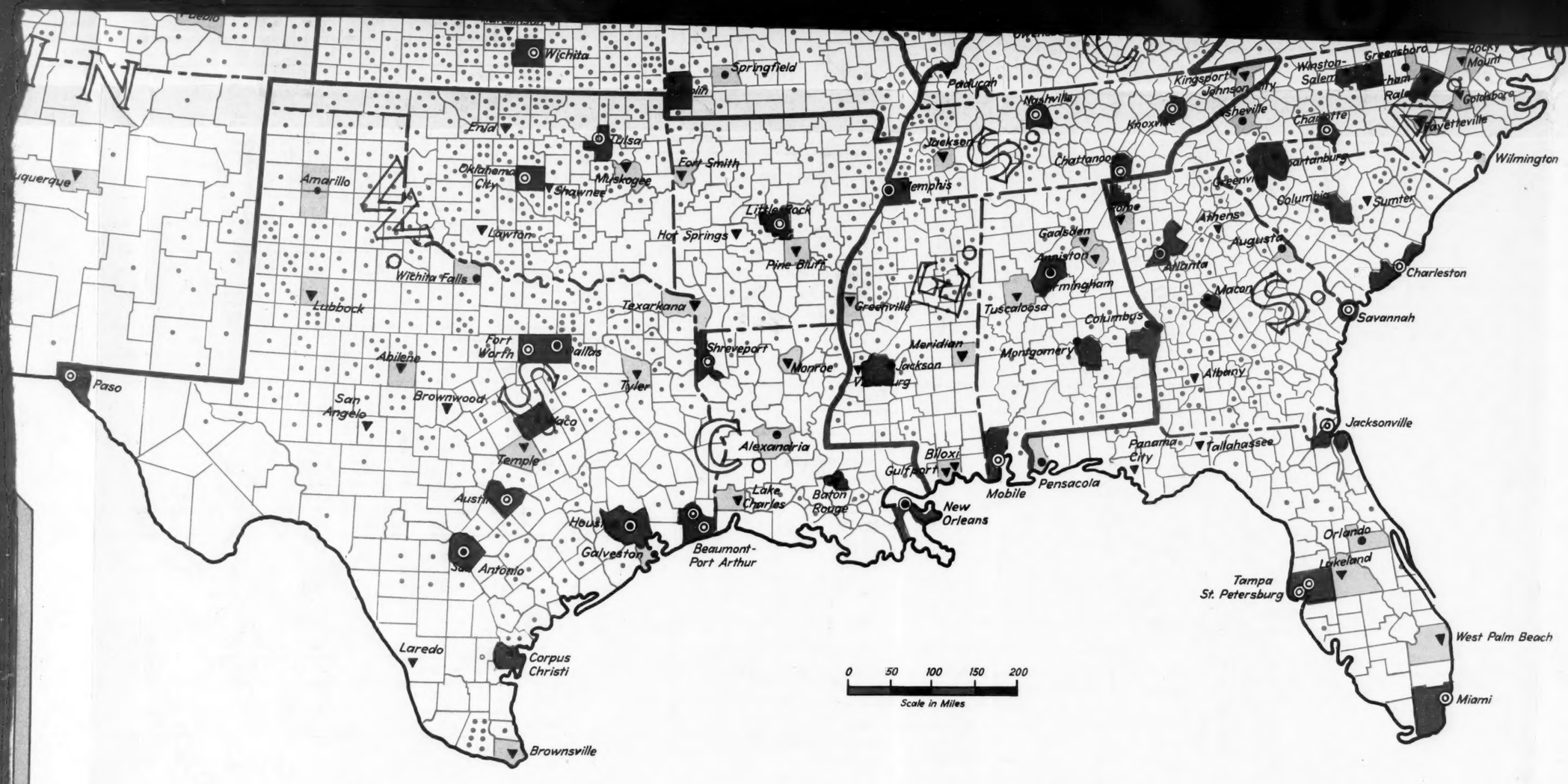

DATA FOR INDIVIDUAL MARKETS

Markets are shown on this map in two ways. Metropolitan city populations are indicated by symbols, and metropolitan county marketing area populations by colors. Population data for city and county areas are given in the tables on the reverse side of the map. Thus it is possible to undertake a study and analysis of individual markets or of entire metropolitan areas.

A marketing sample, showing ways to use this material, is discussed in the text of the report of which this map is a part. Since individual uses will vary, this sample includes only basic market research material. The sample area is in Texas.

Also of marketing interest are the states producing 91.5% of the total U.S. output of frozen fruits and vegetables, shown on Map No. 1 with Food Industries' Frozen Food Distributional Facilities report.

BASE MAP COPYRIGHT RAND McNALLY & COMPANY, CHICAGO R. L. #4658

METROPOLITAN MARKETING AREAS OF U.S.A.

(Showing cities of 25,000 and over)

METROPOLITAN MARKETS by Cities and County Regions (Showing cities of 25,000 pop. or more within market area)	City(ies) Within Market Area: * Population (in 1,000's)	Yearly Retail Food Sales, $, (in 1,000's)	Number of Locker Plants	County(ies) Within Market Area: County(ies)	** Population (in 1,000's)	Yearly Retail Food Sales, $, (in 1,000's)	Number of Locker Plants
REGION: NEW ENGLAND							
MAINE							
Portland	85.0	24,175	0	Cumberland	152.9	35,138	0
Lewiston-Auburn	65.8	12,514	0	Androscoggin	73.7	14,805	0
Bangor	29.0§	8,723	0	Penobscot	86.4	16,274	0
Totals above Cities and Cos.	**179.8**	**45,412**	**0**		**232.0**	**66,217**	**0**
State Totals					**782.2**	**149,890**	**4**
VERMONT							
Burlington	27.7	6,558	3	Chittenden	47.1	9,377	9
Totals above City and Cty.	**27.7**	**6,558**	**3**		**47.1**	**9,377**	**9**
State Totals					**316.1**	**58,185**	**48**
NEW HAMPSHIRE							
Manchester:	77.0	16,354	0	Hillsborough	136.0	28,800	4
Nashua	32.0	7,846	0				
Concord	26.2	6,967	1	Merrimack	49.6	8,295	2
Totals above Cities and Cos.	**135.2**	**31,167**	**1**		**185.6**	**37,095**	**6**
State Totals					**453.3**	**80,075**	**19**
MASSACHUSETTS							
Boston:	750.0§	147,724	1	Essex, Middlesex, Norfolk, Plymouth and Suffolk	2,677.7	506,052	20
Arlington	40.0†	6,208	0				
Belmont	26.8†	4,912	0				
Beverly	25.5†	4,415	1				
Brockton	57.0	11,575	1				
Brookline	50.0	9,084	0				
Cambridge	109.0	21,723	0				
Chelsea	40.0	7,818	0				
Everett	46.8	5,823	0				
Framingham	25.0	5,043	0				
Haverhill	43.5	8,476	0				
Lawrence	80.6‡	14,654	1				
Lowell	101.4	22,837	0				
Lynn	102.0	20,923	0				
Malden	58.8	12,284	0				
Medford	65.0	9,307	0				
Melrose	25.0	4,010	0				
Newton	72.0	14,097	0				
Quincy	79.8‡	17,216	0				
Salem	37.6‡	8,574	0				
Somerville	102.2†	17,844	0				
Waltham	42.0	8,790	0				
Watertown	35.4†	8,274	1				
Weymouth	27.0‡	2,856	0				
Fall River-New Bedford:	230.7	42,098	0	Bristol	342.5	59,892	1
Taunton	37.9	4,466	0				
Springfield-Holyoke‡:	220.6	51,162	0	Hampden and Hampshire	392.6	82,010	2
Chicopee	41.7†	5,914	0				
Worcester:	195.8§	44,731	1	Worcester	472.2	97,666	3
Fitchburg	43.1‡	9,763	0				
Pittsfield	53.1	8,942	1	Berkshire	115.8	20,001	2
Totals above Cities and Cos.	**2,866.1**	**561,543**	**7**		**4,000.8**	**765,621**	**28**
State Totals					**4,093.1**	**787,850**	**30**
CONNECTICUT							
New Haven-Waterbury‡	276.6§	57,924	0	New Haven	477.8	104,955	1
Meriden	40.0	9,770	0				
Hartford‡-New Britain:	255.8	68,443	0	Hartford and Middlesex	532.9	124,900	4
Bristol	40.0	6,544	1				
Manchester	32.0	5,482	—				
Middletown	27.2	5,098	0				
Bridgeport:	156.6§	39,587	0	Fairfield	434.3	107,898	4
Danbury	28.1	8,820	—				
Greenwich	34.0	9,204	—				
Norwalk	43.0	10,844	0				
Stamford	62.0	16,132	0				
Norwich	33.8	8,729	—	New London	129.4	27,673	1
New London	32.0	10,286	0				
Torrington	26.7	6,271	1	Litchfield	87.7	19,359	4
Totals above Cities and Cos.	**1,088.0**	**263,134**	**2**		**1,662.1**	**384,785**	**14**
State Totals					**1,748.5**	**400,007**	**18**
RHODE ISLAND							
Providence:	237.6	66,770	0	Bristol, Kent, Newport and Providence	659.2	155,329	1
Central Falls	25.2†	4,822	0				
Cranston	50.9	7,222	0				
East Providence	32.2	6,998	0				
Pawtucket	78.0	17,254	0				
Newport	41.0	9,266	0				
Warwick	28.8†	3,688	0				
Woonsocket	48.0	14,230	0				
Totals above Cities and Cos.	**540.8**	**130,250**	**0**		**659.2**	**155,329**	**1**
State Totals					**694.5**	**163,553**	**2**
Region Totals					**8,087.7**	**1,639,560**	**121**
REGION: MID ATLANTIC							
NEW YORK							
New York City:	7,756.6§	1,308,175	0	Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland and Westchester, N. Y.; Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic and Union, N. J.	11,758.9	2,230,779	18
Hempstead Twsp., N. Y.	280.0	78,266	0				
Mt. Vernon, N. Y.	67.4	16,187	0				
New Rochelle, N. Y.	51.4	11,760	0				
N. Hempstead Twn., N. Y.	83.4	4,784	0				
White Plains, N. Y.	42.0	14,760	2				
Yonkers, N. Y.	140.0‡	29,427	0				
Rosario, N. J.	74.2	14,709	0				

METROPOLITAN MARKETS by Cities and County Regions (Showing cities of 25,000 pop. or more within market area)	City(ies) Within Market Area: * Population (in 1,000's)	Yearly Retail Food Sales, $, (in 1,000's)	Number of Locker Plants	County(ies) Within Market Area: County(ies)	** Population (in 1,000's)	Yearly Retail Food Sales, $, (in 1,000's)	Number of Locker Plants
REGION: EAST NORTH CENTRAL							
OHIO							
Cleveland:	900.2§	189,416	1	Cuyahoga and Lake#	1,284.0	225,682	3
Cleveland Heights	55.0	14,769	0				
East Cleveland	39.5†	4,486	0				
Lakewood	72.0	12,106	0				
Shaker Heights	25.5	3,902	—				
Cincinnati:	464.7	106,394	1	Hamilton, O.; Dearborn, Ind.; Campbell and Kenton, Ky.	835.2	167,678	5
Norwood, O.	35.5	7,763	1				
Covington, Ky.	65.0	13,664	0				
Newport, Ky.	30.6	8,335	0				
Columbus	327.6	69,718	4	Franklin	415.9	75,771	9
Toledo	297.0§	62,692	3	Lucas	336.4	69,216	3
Akron:	282.5	58,287	0	Summit and Portage#	413.3	80,246	5
Barberton	28.0	4,609	—				
Dayton	250.0§	51,763	2	Montgomery	338.7	60,203	9
Youngstown:	168.0	36,216	1	Mahoning, Trumbull, O.; and Mercer#, Pa.	464.3	79,777	9
Warren, O.	56.0	9,750	1				
Sharon, Pa.	25.7	5,521	1				
Canton:	120.0‡	25,206	1	Stark	247.7	44,235	3
Alliance	26.7	4,701	—				
Massillon	30.8	5,971	0				
Hamilton-Middletown	86.6	17,729	2	Butler	123.3	20,341	3
Springfield	82.0	16,193	3	Clark	100.5	17,770	4
Lima	52.0	7,548	1	Allen	80.8	9,945	3
Lorain	48.2	9,290	0	Lorain	113.5	19,378	5
Mansfield	42.5	8,583	1	Richland	72.8	11,358	2
Zanesville	37.5†	7,733	0	Muskingum	64.9	9,791	2
Newark	36.0	6,934	1	Licking	60.8	9,392	3
Portsmouth	35.5	8,030	1	Scioto	71.0	10,693	1
Marion	35.2	5,684	0	Marion	45.0	6,586	1
Steubenville	34.1	9,546	0	Jefferson	86.1	15,332	0
Elyria	30.0	6,002	2	Lorain (see above).			
Sandusky	28.5	5,305	—	Erie	44.2	7,047	2
Ashtabula	26.2	5,121	0	Ashtabula	63.8	10,826	0
Totals above Cities and Cos.	**3,874.6**	**808,947**	**27**		**5,262.2**	**951,267**	**72**
State Totals					**6,819.5**	**1,180,620**	**232**
INDIANA							
Indianapolis	415.0	69,677	0	Marion	491.1	76,457	1
Evansville	125.0§	22,989	0	Vanderburgh, Ind.; Henderson, Ky.	180.0	27,495	1
Fort Wayne	125.0§	24,586	4	Allen	152.6	28,161	7
South Bend:	112.0	18,929	2	St. Joseph	173.1	25,410	5
Mishawaka	30.5	4,719	0				
Terre Haute	68.2	13,622	1	Vigo	90.6	16,384	1
Anderson	55.7	7,862	1	Madison	91.7	11,757	4
Muncie	52.0	9,171	3	Delaware	75.4	10,479	4
Richmond	37.0	6,090	2	Wayne	58.7	7,893	3
Kokomo	35.5	5,791	0	Howard	46.0	6,986	1
Elkhart	34.0	6,028	1	Elkhart	70.1	9,933	5
LaFayette	30.5	6,842	1	Tippecanoe	52.8	8,686	5
Michigan City	29.0‡	6,172	0	La Porte	67.5	10,696	4
Marion	29.0	4,936	0	Grant	54.8	7,058	3
Logansport	25.3	3,287	—	Cass	34.3	3,947	2
(E. Chicago, Hammond and Gary—see Chicago, Ill.) (New Albany—see Louisville, Ky.)							
Totals above Cities and Cos.	**1,203.7**	**210,701**	**15**		**1,638.7**	**251,342**	**46**
State Totals					**3,383.3**	**455,167**	**159**
ILLINOIS							
Chicago:	3,475.0§	529,355	2	Cook, DuPage and Lake, Ill.; Lake, Ind.	4,508.5	732,015	26
Berwin, Ill.	48.5‡	6,038	0				
Cicero, Ill.	64.7†	8,000	0				
Evanston, Ill.	70.0	19,362	1				
Maywood, Ill.	26.7†	4,250	0				
Oak Park, Ill.	65.0	18,218	0				
Waukegan, Ill.	37.9	8,276	1				
East Chicago, Ind.	63.0	6,852	0				
Gary, Ind.	125.0§	19,001	0				
Hammond, Ind.	78.5	12,829	1				
Peoria	108.0§	25,482	2	Peoria and Tazewell	199.5	37,109	10
Rockford	93.0§	21,069	2	Winnebago	126.1	24,328	3
Springfield	82.5	15,970	4	Sangamon	113.4	18,708	8
Decatur	63.5	12,537	2	Macon	84.6	13,906	6
Aurora	48.0	11,617	3	Kane	129.7	25,411	10
Joliet	46.6	10,636	1	Will	116.3	16,614	8
Quincy	42.0	6,764	1	Adams	58.6	8,225	4
Elgin	40.0	7,500	1	Kane (see above).			
Danville	36.9‡	7,980	1	Vermillion	76.2	12,465	5
Bloomington	32.9	7,643	3	McLean	65.5	11,546	12
Galesburg	30.0	5,415	1	Knox	48.2	7,459	5
Champaign	25.1	5,906	—	Champaign	68.2	11,484	8
(Rock Island and Moline—see Davenport, Iowa.) (Alton, Belleville, E. St. Louis, Granite City—see St. Louis, Mo.)							
Totals above Cities and Cos.	**4,702.8**	**770,700**	**26**		**5,594.8**	**919,270**	**105**
State Totals					**7,564.4**	**1,175,537**	**424**
MICHIGAN							
Detroit:	1,675.0	301,453	0	Macomb, Oakland and Wayne	2,612.1	422,606	17
Dearborn	86.5	10,316	1				
Ferndale	32.0	3,278	—				
Hamtramck	48.9	7,905	0				
Highland Park	50.8	11,368	0				
Pontiac	78.0	15,565	2				
Royal Oak	30.0	6,680	0				
Wyandotte	35.0	6,240	0				
Grand Rapids	164.3	36,349	1	Kent	231.4	41,487	4
Flint	151.5	36,095	0	Genesee	228.2	44,613	4
Saginaw-Bay City	136.1	28,802	4	Bay and Saginaw	206.6	33,255	7
Lansing	90.0	22,010	1	Ingham	136.0	26,759	5
Muskegon	60.8	10,673	0	Muskegon	104.8	14,248	0
Kalamazoo	55.5	14,810	0	Kalamazoo	101.7	17,310	1
Jackson	52.0	13,288	0	Jackson	95.0	16,117	1
Battle Creek	49.9	12,450	2	Calhoun	99.6	18,129	6
Ann Arbor	35.0	9,356	2	Washtenaw	97.8	16,750	7
Port Huron	32.8	8,395	1	St. Clair			

METROPOLITAN MARKETS by Cities and County Regions (Showing cities of 25,000 pop. or more within market area)	City(ies) Within Market Area: * Population (in 1,000's)	Yearly Retail Food Sales, $, (in 1,000's)	Number of Locker Plants	County(ies) Within Market Area: County(ies)	** Population (in 1,000's)	Yearly Retail Food Sales, $,	Number of Locker Plants
REGION: WEST NORTH CENTRAL (Continued)							
NEBRASKA							
Omaha-Council Bluffs	267.7	59,396	3	Douglas, Nebr. and Pottawattamie, Iowa	302.5	62,0	
Lincoln	87.0	14,207	4	Lancaster	92.8	14,4	
Totals above Cities and Cos.	**354.7**	**73,603**	**7**		**395.3**	**76,5**	
State Totals					**1,176.2**	**184,2**	
KANSAS							
Wichita	158.5§	32,658	3	Sedgewick	194.9	33,9	
Topeka	76.6§	16,597	2	Shawnee	84.8	17,3	
Hutchison	33.8	6,823	2	Reno	48.1	8,3	
Salina	30.0	5,081	—	Saline	33.0	5,5	
(Kansas City—see Kansas City, Mo.)							
Totals above Cities and Cos.	**298.9**	**61,159**	**7**		**360.8**	**65,2**	
State Totals					**1,678.4**	**260,3**	
Region Totals					**12,263.3**	**1,623,4**	
REGION: SOUTH ATLANTIC							
DELAWARE							
Wilmington	117.5§	42,371	0	New Castle, Del.; Salem#, N. J.	232.1	58,0	
State Totals					**273.6**	**68,9**	
VIRGINIA							
Norfolk-Portsmouth-Newport News	312.0§	57,219	0	Elizabeth City; Norfolk, Princess Anne and Warwick	505.1	68,4	
Richmond	224.0	47,099	0	Henrico (incl. Richmond) and Chesterfield#	282.1	51,7	
Roanoke	73.0	11,749	1	Roanoke (City and County)	104.8	17,5	
Lynchburg	43.3	6,282	0	Campbell	64.4	8,7	
Petersburg	36.0	6,385	0	Dinwiddie	49.0	7,3	
Danville	31.9	5,611	0	Pittsylvania	88.5	8,5	
(Alexandria—see Washington, D. C.)							
Totals above Cities and Cos.	**720.2**	**134,336**	**1**		**1,093.9**	**162,3**	
State Totals					**2,769.7**	**296,7**	
WEST VIRGINIA							
Huntington, W. Va.-Ashland, Ky.	111.0	16,812	0	Boyd, Ky.; Cabell, W. Va., and Lawrence, O.	172.3	22,4	
Charleston	70.0	15,873	0	Kanawha	224.2	24,4	
Wheeling	63.0	11,643	1	Brooke, Marshall and Ohio, W. Va., and Belmont, O.	204.4	33,2	
Clarksburg	30.6‡	6,173	0	Harrison	72.0	8,9	
Parkersburg	29.3	6,297	1	Wood	55.3	7,7	
Totals above Cities and Cos.	**303.9**	**56,798**	**2**		**728.2**	**97,4**	
State Totals					**1,732.1**	**165,7**	
MARYLAND							
Baltimore	945.1§	241,809	0	Anne Arundel and Baltimore	1,207.4	273,5	
Cumberland	43.0	12,403	0	Allegany	81.3	18,4	
Hagerstown	38.0	9,541	3	Washington	69.9	13,4	
Totals above Cities and Cos.	**1,026.1**	**263,753**	**3**		**1,358.6**	**305,7**	
State Totals					**1,983.1**	**403,4**	
DISTRICT OF COLUMBIA							
Washington:	925.0§	219,102	0	D. of C.; Montgomery and Prince Georges, Md.; Arlington and Fairfax#, Va.	1,336.5	273,4	
Alexandria, Va.	33.5†	8,025	0				
Totals above Cities and Cos.	**958.5**	**227,127**	**0**		**1,336.5**	**273,4**	
District Totals					**925.0**	**219,0**	
NORTH CAROLINA							
Charlotte	100.0	17,111	1	Mecklenburg	146.2	20,0	
Winston-Salem	77.4	8,967	0	Forsyth	109.8	11,0	
Durham	70.0	11,320	0	Durham	80.5	11,0	
Wilmington	70.0	5,332	0	New Hanover	79.1	6,0	
Greensboro:	64.0	9,748	0	Guilford	150.6	17,5	
High Point	40.0	5,832	0				
Raleigh	53.2	5,166	1	Wake	103.4	7,0	
Asheville	53.0	12,185	1	Buncombe	97.4	14,0	
Fayetteville	42.0	3,166	0	Cumberland	62.5	4,0	
Goldsboro	30.0	2,604	—	Wayne	59.2	3,0	
Rocky Mount	26.0	3,885	1	Edgecombe-Nash	92.8	8,0	
Totals above Cities and Cos.	**631.6**	**85,316**	**4**		**981.5**	**104,**	
State Totals					**3,347.5**	**25**	
SOUTH CAROLINA							
Charleston	100.0	14,676	0	Charleston	161.8		
Columbia	70.0	10,822	1	Richland	117.2		
Greenville	38.2	8,927	1	Greenville	140.4		
Spartanburg	36.0	7,390	1	Spartanburg	121.5		
Sumter	26.5	3,706	—	Sumter	49.2		

METROPOLITAN MARKETING AREAS OF U.S.A.

(Showing cities of 25,000 and over)

METROPOLITAN MARKETS by Cities and County Regions (Showing cities of 25,000 pop. or more within market area)	City(ies) Within Market Area: Population (in 1,000's) *	Yearly Retail Food Sales, $, (in 1,000's)	Number of Locker Plants	County(ies) Within Market Area: County(ies)	Population (in 1,000's) **	Yearly Retail Food Sales, $, (in 1,000's)	Number of Locker Plants
ON: EAST NORTH CENTRAL							
eland:	900.2§	189,416	1	Cuyahoga and Lake#	1,284.0	225,682	3
eveland Heights	55.0	14,769	0				
st Cleveland	39.5†	4,486	0				
kewood	72.0	12,106	0				
aker Heights	25.5	3,902	—				
innati:	464.7	106,394	1	Hamilton, O.; Dearborn, Ind.;			
rwood, O.	35.5	7,763	1	Campbell and Kenton, Ky.	835.2	167,678	5
vington, Ky.	65.0	13,664	0				
wport, Ky.	30.6	8,335	0				
mbus	327.6	69,718	4	Franklin	415.9	75,771	9
lo	297.0§	62,692	3	Lucas	336.4	69,216	3
n:	282.5	58,287	0	Summit and Portage#	413.3	80,246	5
rberton	28.0	4,609	—				
on	250.0§	51,763	2	Montgomery	338.7	60,203	9
gstown:	168.0	36,216	1	Mahoning, Trumbull, O.; and			
rren, O.	56.0	9,750	1	Mercer#, Pa.	464.3	79,777	9
aron, Pa.	25.7	5,521	1				
on:	120.0‡	25,206	1	Stark	247.7	44,235	3
liance	26.7	4,701	—				
assilon	30.8	5,971	0				
lton-Middletown	86.6	17,729	2	Butler	123.3	20,341	3
gfield	82.0	16,193	3	Clark	100.5	17,770	4
	52.0	7,548	1	Allen	80.8	9,945	3
n	48.2	9,290	0	Lorain	113.5	19,378	5
dfield	42.5	8,583	1	Richland	72.8	11,358	2
nville	37.5†	7,733	0	Muskingum	64.9	9,791	2
rk	36.0	6,934	1	Licking	60.8	9,392	3
mouth	35.5	8,030	1	Scioto	71.0	10,693	1
on	35.2	5,684	0	Marion	45.0	6,586	1
enville	34.1	9,546	0	Jefferson	86.1	15,332	0
	30.0	6,002	2	Lorain (see above).			
sky	28.5	5,305	—	Erie	44.2	7,047	2
bula	26.2	5,121	0	Ashtabula	63.8	10,826	0
above Cities and Cos...	3,874.6	808,947	27		5,262.2	951,267	72
Totals					6,819.5	1,180,620	232
NA							
napolis	415.0	69,677	0	Marion	491.1	76,457	1
nville	125.0§	22,989	0	Vanderburgh, Ind.; Henderson, Ky.	180.0	27,495	1
Wayne	125.0§	24,586	4	Allen	152.6	28,161	7
Bend:	112.0	18,929	2	St. Joseph	173.1	25,410	5
hawaka	30.5	4,719	0				
Haute	68.2	13,622	1	Vigo	90.6	16,384	1
son	55.7	7,862	1	Madison	91.7	11,757	4
ie	52.0	9,171	3	Delaware	75.4	10,479	4
mond	37.0	6,090	2	Wayne	58.7	7,893	3
mo	35.5	5,791	0	Howard	46.0	6,986	1
rt	34.0	6,028	1	Elkhart	70.1	9,933	5
ette	30.5	6,842	1	Tippecanoe	52.8	8,686	5
gan City	29.0‡	6,172	0	La Porte	67.5	10,696	4
n	29.0	4,936	0	Grant	54.8	7,058	3
sport	25.3	3,287	—	Cass	34.3	3,947	2
Chicago, Hammond and y—see Chicago, Ill.)							
Albany—see Louisville,)							
above Cities and Cos...	1,203.7	210,701	15		1,638.7	251,342	46
otals					3,383.3	455,167	159
IS							
go:	3,475.0§	529,355	2	Cook, DuPage and Lake, Ill.;			
win, Ill.	48.5‡	6,038	0	Lake, Ind.	4,508.5	732,015	26
ro, Ill.	64.7†	8,000	0				
nston, Ill.	70.0	19,362	1				
ywood, Ill.	26.7†	4,250	0				
Park, Ill.	65.0	18,218	0				
ukegan, Ill.	37.9	8,276	1				
Chicago, Ind.	63.0	6,852	0				
y, Ind.	125.0§	19,061	0				
mond, Ind.	78.5	12,829	1				
	108.0§	25,482	2	Peoria and Tazewell	199.5	37,109	10
ord	93.0§	21,069	2	Winnebago	126.1	24,328	3
field	82.5	15,970	4	Sangamon	113.4	18,708	8
ur	63.5	12,537	2	Macon	84.6	13,906	6
	48.0	11,617	3	Kane	129.7	25,411	10
	46.6	10,636	1	Will	116.3	16,614	8
	42.0	6,764	1	Adams	58.6	8,225	4
	40.0	7,500	1	Kane (see above).			
le	36.9‡	7,980	1	Vermillion	76.2	12,465	5
ington	32.9	7,643	3	McLean	65.5	11,546	12
urg	30.0	5,415	1	Knox	48.2	7,459	5
aign	25.1	5,906	—	Champaign	68.2	11,484	8
Island and Moline—see nport, Iowa.)							
Belleville, E. St. Louis, lte City—see St. Louis,							
ove Cities and Cos...	4,702.8	770,700	26		5,594.8	919,270	105
tals					7,564.4	1,175,537	424
AN							
	1,675.0	301,452	0	Macomb, Oakland and Wayne	2,612.1	422,606	17
born	86.5	10,316	1				
dale	32.0	3,278	—				
ramck	48.9	7,905	0				
and Park	50.8	11,368	0				
ac	78.0	15,565	2				
l Oak	30.0	6,680	0				
ndotte	35.0	6,240	0				
Rapids	164.3	36,340	1	Kent	231.4	41,487	4
	151.5	36,095	0	Genessee	228.2	44,613	4
-Bay City	136.1	28,802	4	Bay and Saginaw	206.6	33,255	7
	90.0	22,010	1	Ingham	136.0	26,759	5
on	60.8	10,673	0	Muskegon	104.8	14,248	0
soo	55.5	14,810	0	Kalamazoo	101.7	17,210	1
	52.0	13,288	0	Jackson	95.0	16,117	1
Creek	49.9	12,450	2	Calhoun	99.6	18,129	6
bor	35.0	9,356	2	Washtenaw	97.8	16,750	7

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REGION: WEST NORTH CENTRAL (Continued)							
NEBRASKA							
Omaha-Council Bluffs	267.7	59,396	3	Douglas, Nebr. and Pottawattamie, Iowa	302.5	62,086	16
Lincoln	87.0	14,207	4	Lancaster	92.8	14,439	7
Totals above Cities and Cos...	354.7	73,603	7		395.3	76,525	23
State Totals					1,176.2	184,226	338
KANSAS							
Wichita	158.5§	32,658	3	Sedgewick	194.9	33,960	10
Topeka	76.6§	16,597	2	Shawnee	84.8	17,331	3
Hutchison	33.8	6,823	2	Reno	48.1	8,367	7
Salina	30.0	5,081	—	Saline	33.0	5,564	2
(Kansas City—see Kansas City, Mo.)							
Totals above Cities and Cos...	298.9	61,159	7		360.8	65,222	22
State Totals					1,678.4	260,360	317
Region Totals					12,263.3	1,623,468	2,406
REGION: SOUTH ATLANTIC							
DELAWARE							
Wilmington	117.5§	42,371	0	New Castle, Del.; Salem#, N. J.	232.1	58,041	4
State Totals					273.6	68,990	5
VIRGINIA							
Norfolk-Portsmouth-Newport News	312.0§	57,219	0	Elizabeth City; Norfolk, Princess Anne and Warwick	505.1	68,411	0
Richmond	224.0	47,099	0	Henrico (incl. Richmond) and Chesterfield#	282.1	51,762	1
Roanoke	73.0	11,749	1	Roanoke (City and County)	104.8	17,536	2
Lynchburg	43.3	6,282	0	Campbell	64.4	8,758	0
Petersburg	36.0	6,385	0	Dinwiddie	49.0	7,375	0
Danville	31.9	5,611	0	Pittsylvania	88.5	8,531	0
(Alexandria—see Washington, D. C.)							
Totals above Cities and Cos...	720.2	134,336	1		1,093.9	162,373	3
State Totals					2,769.7	296,790	29
WEST VIRGINIA							
Huntington, W. Va.-Ashland, Ky.	111.0	16,812	0	Boyd, Ky.; Cabell, W. Va., and Lawrence, O.	172.3	22,483	0
Charleston	70.0	15,873	0	Kanawha	224.2	24,910	0
Wheeling	63.0	11,643	1	Brooke, Marshall and Ohio, W. Va., and Belmont, O.	204.4	33,252	4
Clarksburg	30.6‡	6,173	0	Harrison	72.0	8,996	0
Parkersburg	29.3	6,297	1	Wood	55.3	7,931	1
Totals above Cities and Cos...	303.9	56,798	2		728.2	97,572	5
State Totals					1,732.1	165,902	2
MARYLAND							
Baltimore	945.1§	241,809	0	Anne Arundel and Baltimore	1,207.4	273,902	2
Cumberland	43.0	12,403	0	Allegany	81.3	18,434	0
Hagerstown	38.0	9,541	3	Washington	69.9	13,010	3
Totals above Cities and Cos...	1,026.1	263,753	3		1,358.6	305,346	5
State Totals					1,983.1	403,014	22
DISTRICT OF COLUMBIA							
Washington	925.0§	219,102	0	D. of C.; Montgomery and Prince Georges, Md.; Arlington and Fairfax#, Va.	1,336.5	273,308	1
Alexandria, Va.	33.5†	8,025	0				
Totals above Cities and Cos...	958.5	227,127	0		1,336.5	273,308	1
District Totals					925.0	219,102	0
NORTH CAROLINA							
Charlotte	106.0	17,111	1	Mecklenburg	146.2	20,131	1
Winston-Salem	77.4	8,967	0	Forsyth	109.8	11,310	0
Durham	70.0	11,320	0	Durham	80.5	11,654	0
Wilmington	70.0	5,332	0	New Hanover	79.1	6,144	0
Greensboro:	64.0	9,748	0	Guilford	160.6	17,288	0
High Point	40.0	5,832	0				
Raleigh	53.2	5,166	1	Wake	103.4	7,342	1
Asheville	53.0	12,185	1	Buncombe	97.4	14,799	1
Fayetteville	42.0	3,166	0	Cumberland	62.5	4,082	0
Goldsboro	30.0	2,604	—	Wayne	59.2	3,697	2
Rocky Mount	26.0	3,885	1	Edgecombe-Nash	92.8	8,133	1
Totals above Cities and Cos...	631.6	85,316	4		981.5	104,580	6
State Totals					3,347.5	258,380	29
SOUTH CAROLINA							
Charleston	100.0	14,676	0	Charleston	161.8	18,392	0
Columbia	70.0	10,822	1	Richland	117.2	12,781	2
Greenville	38.2	8,927	1	Greenville	140.4	18,592	4
Spartanburg	36.0	7,390	1	Spartanburg	121.5	12,570	1
Sumter	26.5	3,706	—	Sumter	49.2	4,643	1

METROPOLITAN MARKETS by Cities and County Regions (Showing cities of 25,000 pop. or more within market area)	City(ies) Within Market Area: Population (in 1,000's) *	Yearly Retail Food Sales, $, (in 1,000's)	Number of Locker Plants	County(ies) Within Market Area: County(ies)	Population (in 1,000's) **	Yearly Retail Food Sales, $, (in 1,000's)	Number of Locker Plants
REGION: WEST SOUTH CENTRAL							
OKLAHOMA							
Oklahoma City	221.6§	29,330	5	Oklahoma	256.6	31,210	8
Tulsa	176.1§	25,652	6	Tulsa	213.2	30,648	11
Muskogee	38.1	5,956	1	Muskogee	62.9	6,773	1
Lawton	37.5	3,075	—	Comanche	47.0	3,943	1
Enid	32.0	5,506	1	Garfield	39.7	6,078	5
Shawnee	25.0	3,474	—	Pottawatomie	42.8	5,128	4
Totals above Cities and Cos...	530.3	72,993	13		662.2	83,780	30
State Totals					1,988.4	228,981	177
TEXAS							
Houston	448.5§	78,516	1	Harris	601.2	87,601	2
Dallas	398.6§	53,217	5	Dallas	443.0	63,337	13
San Antonio	350.0§	37,375	4	Bexar	364.3	41,907	4
Fort Worth	230.0§	32,635	5	Tarrant	267.9	35,750	9
Beaumont-Port Arthur	133.5	20,343	0	Jefferson	178.2	22,309	0
El Paso	107.0	11,827	2	El Paso	136.2	13,959	2
Austin	100.0	15,645	3	Travis	106.2	16,370	3
Corpus Christi	87.0	10,937	0	Nueces	113.4	13,772	2
Galveston	78.0	9,509	1	Galveston	94.3	13,700	1
Waco	66.0	9,468	3	McLennon	103.2	12,189	4
Amarillo	59.3	9,913	1	Potter, Randall#	65.2	11,072	2
Wichita Falls	52.0	7,678	2	Wichita	73.0	10,161	4
Laredo	45.0	3,301	0	Webb	45.7	4,004	0
Lubbock	43.1	6,933	2	Lubbock	66.2	8,050	3
Abilene	34.0	5,484	1	Taylor	51.1	6,726	4
Tyler	33.0	6,043	2	Smith	60.8	7,967	3
San Angelo	31.7	5,784	1	Tom Green	39.5	6,271	1
Brownsville	30.0	2,225	—	Cameron	79.9	7,450	6
Texarkana	26.0	3,425	—	Bowie, Tex.; Miller, Ark.	87.1	8,493	1
Brownwood	26.0	2,783	—	Brown	32.8	3,146	1
Temple	25.5	3,208	—	Bell	51.8	5,329	4
Totals above Cities and Cos...	2,404.2	336,249	33		3,061.0	399,563	69
State Totals					6,260.3	787,044	332
ARKANSAS							
Little Rock:	99.8	15,088	1	Pulaski	165.8	21,092	2
North Little Rock	26.0	3,417	—				
Fort Smith	45.0	6,624	1	Sebastian	58.3	7,959	1
Pine Bluff	35.0	3,953	0	Jefferson	72.8	5,814	0
Hot Springs	33.7	5,204	0	Garland	37.9	5,941	0
Totals above Cities and Cos...	239.5	34,286	2		334.8	40,806	3
State Totals					1,736.1	140,838	55
LOUISIANA							
New Orleans	554.0§	69,007	0	Orleans, Jefferson, St. Bernard#	624.1	75,987	0
Shreveport	115.0§	17,864	2	Caddo	139.7	21,433	2
Alexandria	50.0	3,757	0	Rapides	88.7	6,405	0
Baton Rouge	36.0	9,722	1	E. Baton Rouge	107.1	13,824	1
Lake Charles	33.0	3,537	0	Calcasieu	73.3	6,876	0
Monroe	33.0	4,940	0	Ouachita	57.7	7,849	1
Totals above Cities and Cos...	821.0	108,827	3		1,090.6	132,374	4
State Totals					2,349.2	210,140	19
Region Totals					12,334.0	1,367,003	583
REGION: MOUNTAIN							
MONTANA							
Butte	40.3	9,653	4	Silver Bow	46.4	11,279	4
Great Falls	38.0	5,917	2	Cascade	42.0	6,924	5
Billings	25.1	5,256	—	Yellowstone	37.9	6,033	9
Totals above Cities and Cos...	103.4	20,826	6		126.3	24,236	18
State Totals					470.3	75,950	139
IDAHO							
Boise	30.0	7,120	6	Ada	49.1	8,751	12
State Totals					473.3	68,421	148
WYOMING							
Cheyenne	33.0	5,783	—	Laramie	37.6	6,329	6
State Totals					235.7	37,460	53
COLORADO							
Denver	335.4	63,300	3	Denver, Arapahoe and Jefferson	405.4	70,532	12
Pueblo	58.0	7,759	6	Pueblo	73.3	8,150	8
Colorado Springs	45.0	9,237	2	El Paso	61.2	10,261	3
Totals above Cities and Cos...	438.4	80,296	11		539.9	88,943	23
State Totals					1,067.3	154,587	125
UTAH							
Salt Lake City	178.9	34,918	8	Salt Lake	230.4	41,630	16
Ogden	65.0§	12,617	4	Weber	70.2	13,332	7
Provo	25.1	2,850	—	Utah	68.4	5,425	11
Totals above Cities and Cos...	269.0	50,385	12		368.8	60,387	34
State Totals					583.4	79,256	77
NEVADA							
Reno	25.5	8,321	—	Washoe	35.8	10,921	

	27.2	5,098	0				
Bridgeport:	156.6§	39,587	0	Fairfield	434.3	107,898	4
Danbury	28.1	8,820	—				
Greenwich	34.0	9,204	—				
Norwalk	43.0	10,844	0				
Stamford	62.0	16,132	0				
Norwich	33.8	8,729	—	New London	129.4	27,673	1
New London	32.0	10,286	0				
Torrington	26.7	6,271	1	Litchfield	87.7	19,359	4
Totals above Cities and Cos.	**1,988.0**	**263,134**	**2**		**1,662.1**	**384,785**	**14**
State Totals					**1,748.5**	**400,007**	**18**
RHODE ISLAND							
Providence:	237.6	66,770	0	Bristol, Kent, Newport and			
Central Falls	25.2†	4,822	0	Providence	659.2	155,329	1
Cranston	50.0	7,222	0				
East Providence	32.2	6,998	0				
Pawtucket	78.0	17,254	0				
Newport	41.0	9,266	0				
Warwick	28.8†	3,688	0				
Woonsocket	48.0	14,230	0				
Totals above Cities and Cos.	**540.8**	**130,250**	**0**		**659.2**	**155,329**	**1**
State Totals					**694.5**	**163,553**	**2**
Region Totals					**8,087.7**	**1,639,560**	**121**

REGION: MID ATLANTIC

NEW YORK							
New York City:	7,756.6§	1,308,175	0	Bronx, Kings, Nassau, New			
Hempstead Twsp., N. Y.	280.0	78,266	0	York, Queens, Richmond,			
Mt. Vernon, N. Y.	67.4	16,187	0	Rockland and Westchester,			
New Rochelle, N. Y.	51.4	11,760	0	N. Y.; Bergen, Essex, Hud-			
N. Hempstead Twn., N. Y.	83.4	4,784	0	son, Middlesex, Monmouth,			
White Plains, N. Y.	42.0	14,760	2	Morris, Passaic and Union,			
Yonkers, N. Y.	140.0‡	29,427	0	N. J.	11,758.9	2,230,779	18
Bayonne, N. J.	74.2	14,709	0				
Belleville, N. J.	28.2†	4,354	0				
Bloomfield, N. J.	42.6	9,735	0				
Clifton, N. J.	57.0	8,260	0				
East Orange, N. J.	69.8	14,729	0				
Elisabeth, N. J.	118.0‡	25,562	0				
Garfield, N. J.	29.0	3,764	0				
Hackensack, N. J.	25.0	14,698	0				
Hoboken, N. J.	50.0	11,454	0				
Irvington, N. J.	60.0	13,040	0				
Jersey City, N. J.	301.2	51,561	0				
Kearny, N. J.	39.3	7,130	0				
Montclair, N. J.	44.0‡	15,319	0				
Newark, N. J.	440.0§	119,794	0				
New Brunswick, N. J.	35.5†	11,413	0				
North Bergen, N. J.	37.0	6,001	0				
Orange, N. J.	36.4	11,382	0				
Passaic, N. J.	62.6	20,384	0				
Paterson, N. J.	127.8	46,394	0				
Perth Amboy, N. J.	41.2†	9,826	0				
Plainfield, N. J.	39.0	16,082	0				
Teaneck, N. J.	25.3†	6,388	0				
Union, N. J.	28.5	4,211	0				
Union City, N. J.	54.2	14,108	0				
West New York, N. J.	38.0	9,775	0				
West Orange, N. J.	29.1	4,781	0				
Woodbridge, N. J.	27.2†	3,469	0				
Buffalo‖-Niagara Falls	697.0	122,831	1	Erie and Niagara	961.4	159,120	11
Lockport	25.0	4,694	0				
Rochester	325.0§	69,771	1	Monroe	418.7	78,851	5
Albany‖-Schenectady-Troy	305.6	59,582	1	Albany, Rensselaer and			
				Schenectady	446.6	76,120	3
Syracuse	217.0§	40,201	1	Onondaga	283.2	46,887	6
Utica-Rome	155.4	23,623	2	Oneida and Herkimer	258.5	33,011	11
Binghamton:	91.5§	15,766	3	Broome	164.4	27,526	4
Endicott	25.1	4,150	0				
Elmira	47.2§	12,356	2	Chemung	75.9	15,140	2
Jamestown	43.0	9,419	1	Chautauqua	113.8	18,817	4
Poughkeepsie	42.0	11,699	2	Dutchess	114.2	20,778	8
Watertown	36.0	5,711	1	Jefferson	77.2	10,333	4
Auburn	35.8§	6,471	0	Cayuga	59.4	8,648	1
Newburgh	32.8	7,898	1	Orange	125.4	22,370	4
Amsterdam	31.5§	5,998	1	Montgomery	53.4	8,741	3
Kingston	28.6†	6,635	1	Ulster	77.0	12,972	5
Glens Falls	27.0	4,920	0	Warren	34.3	6,573	0
Totals above Cities and Cos.	**12,546.4**	**2,353,407**	**20**		**15,022.3**	**2,776,666**	**89**
State Totals					**13,498.8**	**2,278,893**	**161**
NEW JERSEY							
Trenton	127.0	32,377	1	Mercer	196.4	40,169	1
Atlantic City	60.0‡	19,377	0	Atlantic	107.5	30,811	0
(Camden—see Philadelphia, Pa.)							
(Cities in N. E. New Jersey of 25,000 pop. or more included in New York market.)							
Totals above Cities and Cos.	**187.0**	**51,754**	**1**		**303.9**	**70,980**	**1**
State Totals					**4,080.8**	**920,940**	**27**
PENNSYLVANIA							
Philadelphia:	2,017.6§	340,423	0	Delaware, Montgomery, Phil-			
Camden, N. J.	125.0	25,755	0	adelphia, and Bucks‖, Pa.;			
Chester, Pa.	80.0	20,463	0	Burlington, Camden and			
Lower Merion	39.6†	8,844	0	Gloucester, N. J.	3,184.6	532,634	24
Norristown	37.0	8,388	1				
Upper Darby	56.9†	11,315	0				
Pittsburgh:	707.0§	152,448	2	Allegheny, Fayette, Washing-			
Aliquippa	27.0†	4,690	0	ton, Westmoreland and			
McKeesport	58.0	16,695	1	Beaver‖	2,118.6	398,681	13
Washington	26.4‡	8,195	1				
Wilkinsburg	30.0‡	6,341	0				
Scranton-Wilkes-Barre:	185.3	41,888	1	Lackawanna and Luzerne	584.3	102,325	2
Hazelton	35.5‡	8,337	1				
Allentown‡-Bethlehem-Easton	204.0	42,100	2	Lehigh and Northampton,			
				Pa.; Warren‖ N. J.	381.7	65,801	4
Erie	127.0	28,010	3	Erie	185.2	35,628	5
Reading	114.4	24,039	2	Berks	223.1	36,235	8
Harrisburg	88.7	18,974	2	Dauphin	173.7	29,205	3
Altoona	73.0	14,749	1	Blair	126.0	20,676	4
Johnstown	66.7	11,842	1	Cambria	187.4	23,198	2
Lancaster	61.3	12,308	2	Lancaster	201.6	27,949	14
York	56.5	13,331	1	York	170.4	25,173	10
New Castle	47.6‡	9,857	1	Lawrence	93.1	14,598	1
Williamsport	46.5	9,330	1	Lycoming	91.0	15,722	1
Lebanon	28.9	4,579	2	Lebanon	68.0	9,158	4
Pottsville	25.0	4,599	—	Schuylkill	186.4	27,503	2
Butler	25.0	6,777	—	Butler	81.3	11,751	1
(Sharon—see Youngstown, O.)							
Totals above Cities and Cos.	**4,389.9**	**854,277**	**25**		**8,056.4**	**1,376,237**	**98**
State Totals					**9,346.2**	**1,540,215**	**146**
Region Totals					**26,925.8**	**4,740,048**	**334**

East Chicago, Ind.	63.0	6,852	0				
Gary, Ind.	125.0§	19,001	0				
Hammond, Ind.	78.5	12,829	1				
Peoria	108.0§	25,482	2	Peoria and Tazewell	199.5	37,109	10
Rockford	93.0§	21,069	2	Winnebago	126.1	24,328	3
Springfield	82.5	15,970	4	Sangamon	113.4	18,708	8
Decatur	63.5	12,537	2	Macon	84.6	13,906	6
Aurora	48.0	11,617	3	Kane	129.7	25,411	10
Joliet	46.6	10,636	1	Will	116.3	16,614	8
Quincy	42.0	6,764	1	Adams	58.6	8,225	4
Elgin	40.0	7,500	1	Kane (see above).			
Danville	36.0‡	7,980	1	Vermillion	76.2	12,465	5
Bloomington	32.9	7,643	3	McLean	65.5	11,546	12
Galesburg	30.0	5,415	1	Knox	48.2	7,459	5
Champaign	25.1	5,906	—	Champaign	68.2	11,484	8
(Rock Island and Moline—see Davenport, Iowa.)							
(Alton, Belleville, E. St. Louis, Granite City—see St. Louis, Mo.)							
Totals above Cities and Cos.	**4,702.8**	**770,700**	**26**		**5,594.8**	**919,270**	**105**
State Totals					**7,564.4**	**1,175,537**	**424**
MICHIGAN							
Detroit:	1,675.0	301,453	0	Macomb, Oakland and Wayne	2,612.1	422,606	17
Dearborn	86.5	10,316	1				
Ferndale	32.0	3,278	—				
Hamtramck	48.9	7,905	0				
Highland Park	50.8	11,368	0				
Pontiac	78.0	15,565	2				
Royal Oak	30.0	6,680	0				
Wyandotte	35.0	6,240	0				
Grand Rapids	164.3	36,349	1	Kent	231.4	41,487	4
Flint	151.5	36,095	0	Genessee	228.2	44,613	4
Saginaw-Bay City	136.1	28,802	4	Bay and Saginaw	206.6	33,255	7
Lansing	90.0	22,010	1	Ingham	136.0	26,759	5
Muskegon	60.8	10,673	0	Muskegon	104.8	14,248	0
Kalamazoo	55.5	14,810	0	Kalamazoo	101.7	17,210	1
Jackson	52.0	13,288	0	Jackson	95.0	16,117	1
Battle Creek	49.9	12,450	2	Calhoun	99.6	18,129	6
Ann Arbor	35.0	9,356	2	Washtenaw	97.8	16,750	7
Port Huron	32.8	8,395	1	St. Clair	76.8	12,941	3
Totals above Cities and Cos.	**2,864.1**	**555,033**	**14**		**3,990.0**	**664,115**	**55**
State Totals					**5,377.3**	**873,431**	**174**
WISCONSIN							
Milwaukee:	602.5§	131,020	0	Milwaukee and Waukesha‖	826.8	158,838	5
Wauwatosa	28.0	4,301	0				
West Allis	37.0	6,232	0				
Racine-Kenosha	121.5	22,915	2	Kenosha and Racine	154.2	28,441	6
Madison	75.7	16,162	2	Dane	135.2	21,351	13
Green Bay	45.4	9,532	2	Brown	82.4	12,126	36
La Crosse	44.0	8,377	2	La Crosse	55.6	9,726	3
Sheboygan	42.5	9,348	1	Sheboygan	70.7	12,535	6
Oshkosh	40.7	7,723	2	Winnebago	76.5	13,383	8
Eau Claire	34.5	5,210	2	Eau Claire	43.1	6,395	4
Beloit	29.0‡	6,201	1	Rock	78.6	14,711	8
Manitowoc	28.5	8,806	—	Manitowoc	62.9	8,847	30
Appleton	28.0	5,833	3	Outagamie	65.7	9,797	25
Fond du Lac	28.0	5,067	2	Fond du Lac	56.2	8,285	13
Wausau	26.5	5,343	2	Marathon	66.7	7,784	15
(Superior—see Duluth, Minn.)							
Totals above Cities and Cos.	**1,211.8**	**252,070**	**21**		**1,772.8**	**312,219**	**172**
State Totals					**2,945.7**	**439,910**	**478**
Region Totals					**26,090.2**	**4,124,665**	**1,476**

REGION: WEST NORTH CENTRAL

MINNESOTA							
Minneapolis-St. Paul	787.4	157,742	8	Anoka, Hennepin, Ramsey, Washington and Dakota‖	942.5	179,835	21
Duluth-Superior	144.5	27,319	2	St. Louis, Minn. and Douglas, Wis.	228.7	38,833	4
Rochester	27.6	4,032	2	Olmsted	37.2	4,923	6
Totals above Cities and Cos.	**959.5**	**189,093**	**12**		**1,208.4**	**223,591**	**31**
State Totals					**2,525.8**	**355,195**	**489**
NORTH DAKOTA							
Fargo	29.0	5,241	2	Cass	45.6	6,246	11
State Totals					**536.5**	**57,201**	**194**
SOUTH DAKOTA							
Sioux Falls	48.0	9,246	4	Minnehaha	57.4	10,176	12
State Totals					**545.0**	**60,198**	**201**
MISSOURI							
St. Louis:	835.0§	128,140	2	St. Louis (City and Co.) and			
University City, Mo.	33.0	5,445	0	St. Charles, Mo.; Madison			
Alton, Ill.	34.0‡	7,306	1	and St. Clair, Ill.	1,485.9	215,932	14
Belleville, Ill.	28.4†	5,875	1				
East St. Louis, Ill.	80.0	15,582	0				
Granite City, Ill.	25.0‡	3,995	—				
Kansas City, Mo.-Kansas City, Kan.	566.7	97,069	14	Jackson and Clay‖, Mo.; Johnson and Wyandotte, Kan.	663.8	109,012	30
St. Joseph	70.0	10,553	1	Buchanan	80.0	11,054	1
Springfield	64.9	10,747	5	Greene	85.3	11,728	8
Joplin	40.6	5,251	1	Newton and Jasper	101.6	11,358	4
Totals above Cities and Cos.	**1,777.6**	**289,963**	**25**		**2,416.6**	**358,984**	**57**
State Totals					**3,524.5**	**410,960**	**193**
IOWA							
Davenport-Rock Island-Moline (including East Moline)	174.5	29,160	2	Scott, Iowa; Rock Island, Ill.	201.2	32,994	12
Des Moines	174.0§	27,632	6	Polk	188.6	30,209	11
Sioux City	87.0§	15,131	3	Woodbury	89.7	16,263	13
Cedar Rapids	67.0	11,057	3	Linn	87.2	12,522	12
Waterloo	60.0	10,236	1	Black Hawk	76.0	12,824	8
Dubuque	48.7	7,108	2	Dubuque	58.7	8,126	6
Ottumwa	35.0	5,508	2	Wapello	42.6	6,100	6
Burlington	33.0	5,560	1	Des Moines	39.7	6,100	2
Clinton	30.5	5,165	1	Clinton	43.5	6,453	9
Mason City	26.0	4,843	2	Cerro Gordo	37.5	5,882	11
(Council Bluffs—see Omaha, Nebr.)							
Totals above Cities and Cos.	**735.7**	**121,400**	**23**		**864.7**	**137,473**	**90**
State Totals					**2,276.9**	**295,328**	**674**

Totals above Cities and Cos.	**1,026.1**	**263,753**	**3**		
State Totals					
DISTRICT OF COLUMBIA					
Washington:	925.0§	219,102	0	D. of C.; Montgomery and	
Alexandria, Va.	33.5†	8,025	0	Prince Georges, Md.; Ar-	
				lington and Fairfax‖, Va.	
Totals above Cities and Cos.	**958.5**	**227,127**	**0**		
District Totals					
NORTH CAROLINA					
Charlotte	106.0	17,111	1	Mecklenburg	
Winston-Salem	77.4	8,967	0	Forsyth	
Durham	70.0	11,320	0	Durham	
Wilmington	70.0	5,332	0	New Hanover	
Greensboro:	64.0	9,748	0	Guilford	
High Point	40.0	5,832	0		
Raleigh	53.2	5,166	1	Wake	
Asheville	53.0	12,185	1	Buncombe	
Fayetteville	42.0	3,166	0	Cumberland	
Goldsboro	30.0	2,604	—	Wayne	
Rocky Mount	26.0	3,885	1	Edgecombe-Nash	
Totals above Cities and Cos.	**631.6**	**85,316**	**4**		
State Totals					
SOUTH CAROLINA					
Charleston	100.0	14,676	0	Charleston	
Columbia	70.0	10,822	1	Richland	
Greenville	38.2	8,927	1	Greenville	
Spartanburg	36.0	7,390	1	Spartanburg	
Sumter	26.5	3,706	—	Sumter	
Totals above Cities and Cos.	**270.7**	**45,521**	**3**		
State Totals					
GEORGIA					
Atlanta	333.5§	51,424	0	De Kalb, Fulton	
Savannah	135.0	22,198	0	Chatham	
Macon	75.0	11,550	0	Bibb	
Augusta	73.5	8,593	0	Richmond	
Columbus	60.0	9,989	0	Muscogee, Ga.; Russell, Ala.	
Albany	29.1	2,930	—	Dougherty	
Rome	26.9	4,278	0	Floyd	
Athens	24.5	4,130	—	Clarke	
Totals above Cities and Cos.	**756.5**	**115,092**	**0**		
State Totals					
FLORIDA					
Jacksonville	235.9§	27,545	1	Duval	
Tampa‖-St. Petersburg	205.1	25,818	1	Hillsborough and Pinellas	
Miami:	200.0§	32,960	1	Dade	
Miami Beach	31.3	5,543	0		
Pensacola	55.0	7,014	0	Escambia	
Orlando	52.1	6,652	2	Orange	
West Palm Beach	33.7	7,984	0	Palm Beach	
Panama City	33.0	3,450	—	Bay	
Lakeland	25.0	4,211	—	Polk	
Tallahassee	25.0	2,654	—	Leon	
Totals above Cities and Cos.	**896.1**	**123,831**	**5**		
State Totals					
Region Totals					

REGION: EAST SOUTH CENTRAL

ALABAMA					
Birmingham	303.0	40,419	0	Jefferson	
Mobile	150.0§	18,755	0	Mobile	
Montgomery	95.0	9,189	1	Montgomery	
Gadsden	42.2	4,874	0	Etowah	
Anniston	38.0	4,273	1	Calhoun	
Tuscaloosa	30.0	4,659	1	Tuscaloosa	
Totals above Cities and Cos.	**658.2**	**82,169**	**3**		
State Totals					
TENNESSEE					
Memphis	321.9	40,568	3	Shelby	
Nashville	174.1	28,216	1	Davidson	
Chattanooga	135.0	21,586	0	Hamilton, Tenn.; Walker, Ga.	
Knoxville	135.0§	22,720	2	Knox	
Jackson	32.2	4,066	—	Madison	
Johnson City	29.0	3,862	0	Washington	
Kingsport	28.0	2,830	0	Sullivan	
Totals above Cities and Cos.	**855.2**	**123,848**	**6**		
State Totals					
KENTUCKY					
Louisville:	365.0§	64,076	0	Jefferson, Ky.; Clarke and	
New Albany, Ind.	30.0	4,039	0	Floyd, Ind.	
Lexington	53.0	9,477	1	Fayette	
Paducah	35.5	5,927	1	McCracken	
Owensboro	33.0	4,922	1	Daviess	
(Ashland—see Huntington, W. Va.)					
(Covington—see Cincinnati, O.)					
(Newport—see Cincinnati, O.)					
Totals above Cities and Cos.	**516.5**	**88,441**	**3**		
State Totals					
MISSISSIPPI					
Jackson	60.9	11,104	1	Hinds	
Meridian	40.0	5,693	1	Lauderdale	
Gulfport	30.0	2,269	—	Harrison	
Vicksburg	26.1	4,308	—	Warren	
Greenville	25.0	3,377	—	Washington	
Biloxi	25.0	1,955	—	Harrison (see above).	
Totals above Cities and Cos.	**216.0**	**28,706**	**2**		
State Totals					
Region Totals					

ind	125.0§	19,001	0				
ond, Ind.	78.5	12,829	1				
	108.0§	25,482	2	Peoria and Tazewell	199.5	37,109	10
d	93.0§	21,069	2	Winnebago	126.1	24,328	3
ld	82.5	15,970	4	Sangamon	113.4	18,708	8
	63.5	12,537	2	Macon	84.6	13,906	6
	48.0	11,617	3	Kane	129.7	25,411	10
	46.6	10,636	1	Will	116.3	16,614	8
	42.0	6,764	1	Adams	58.6	8,225	4
	40.0	7,500	1	Kane (see above).			
	36.9‡	7,980	1	Vermillion	76.2	12,465	5
gton	32.9	7,643	3	McLean	65.5	11,546	12
g	30.0	5,415	1	Knox	48.2	7,459	5
ign	25.1	5,906	—	Champaign	68.2	11,484	8
sland and Moline—see port, Iowa.)							
Belleville, E. St. Louis, te City—see St. Louis,							
ove Cities and Cos...	4,702.8	770,700	26		5,594.8	919,270	105
als					7,564.4	1,175,537	424
AN							
	1,675.0	301,453	0	Macomb, Oakland and Wayne	2,612.1	422,606	17
born	86.5	10,316	1				
dale	32.0	3,278	—				
ranick	48.9	7,905	0				
and Park	50.8	11,368	0				
sc	78.0	15,565	2				
l Oak	30.0	6,680	0				
ndotte	35.0	6,240	0				
Rapids	164.3	36,349	1	Kent	231.4	41,487	4
	151.5	36,095	0	Genessee	228.2	44,613	4
-Bay City	136.1	28,802	4	Bay and Saginaw	206.6	33,255	7
	90.0	22,010	1	Ingham	136.0	26,759	5
on	60.8	10,673	0	Muskegon	104.8	14,248	0
azoo	55.5	14,910	0	Kalamazoo	101.7	17,210	1
	52.0	13,288	0	Jackson	95.0	16,117	1
Creek	49.9	12,450	2	Calhoun	99.6	18,129	6
bor	35.0	9,356	2	Washtenaw	97.8	16,750	7
uron	32.8	8,395	1	St. Clair	76.8	12,941	3
ove Cities and Cos...	2,864.1	555,033	14		3,990.0	664,115	55
tals					5,377.3	873,431	174
SIN							
kee	602.5§	131,020	0	Milwaukee and Waukesha‡	826.8	158,838	5
watosa	28.0	4,301	0				
Allis	37.0	6,232	0				
-Kenosha	121.5	22,915	2	Kenosha and Racine	154.2	28,441	6
n	75.7	16,162	2	Dane	135.2	21,351	13
Bay	45.4	9,532	2	Brown	82.4	12,126	36
sse	44.0	8,377	2	La Crosse	55.6	9,726	3
gan	42.5	9,348	1	Sheboygan	70.7	12,535	6
h	40.7	7,723	2	Winnebago	76.5	13,383	8
aire	34.5	5,210	2	Eau Claire	43.1	6,395	4
	29.0‡	6,201	1	Rock	78.6	14,711	8
woc	28.5	5,806	—	Manitowoc	62.9	8,847	30
on	28.0	5,833	3	Outagamie	65.7	9,797	25
u Lac	28.0	5,067	2	Fond du Lac	56.2	8,285	13
	26.5	5,343	2	Marathon	66.7	7,784	15
or—see Duluth, Minn.)							
ove Cities and Cos...	1,211.8	252,070	21		1,772.8	312,219	172
tals					2,945.7	439,910	478
Totals					26,090.2	4,124,665	1,476

REGION: WEST NORTH CENTRAL

SOTA							
apolis-St. Paul	787.4	157,742	8	Anoka, Hennepin, Ramsey, Washington and Dakota‡..	942.5	179,835	21
-Superior	144.5	27,319	2	St. Louis, Minn. and Douglas, Wis.	228.7	38,833	4
ter	27.6	4,032	2	Olmsted	37.2	4,923	6
bove Cities and Cos...	959.5	189,093	12		1,208.4	223,591	31
otals					2,525.8	355,195	489
DAKOTA	29.0	5,241	2	Cass	45.6	6,246	11
otals					536.5	57,201	194
DAKOTA							
Falls	48.0	9,246	4	Minnehaha	57.4	10,176	12
otals					545.0	60,198	201
URI							
uis	835.0§	128,140	2	St. Louis (City and Co.) and St. Charles, Mo.; Madison and St. Clair, Ill.	1,485.9	215,932	14
versity City, Mo.	33.0	5,445	0				
n, Ill.	34.0‡	7,306	1				
eville, Ill.	28.4†	5,875	1				
t St. Louis, Ill.	80.0	15,582	0				
nite City, Ill.	25.0‡	3,995	—				
s City, Mo.-Kansas City,							
	566.7	97,069	14	Jackson and Clay‡, Mo.; Johnson and Wyandotte, Kan.	663.8	109,012	30
seph	70.0	10,553	1	Buchanan	80.0	11,054	1
field	64.9	10,747	5	Greene	85.3	11,728	8
	40.6	5,251	1	Newton and Jasper	101.6	11,258	4
bove Cities and Cos...	1,777.6	289,963	25		2,416.6	358,984	57
otals					3,524.5	410,960	193
port-Rock Island-Moline luding East Moline)	174.5	29,160	2	Scott, Iowa; Rock Island, Ill.	201.2	32,994	12
Moines	174.0§	27,632	6	Polk	188.6	30,209	11
City	87.0§	15,131	3	Woodbury	89.7	16,263	13
Rapids	67.0	11,057	3	Linn	87.2	12,522	12
loo	60.0	10,236	1	Black Hawk	76.0	12,824	8
que	48.7	7,108	2	Dubuque	58.7	8,126	6
wa	35.0	5,508	2	Wapello	42.6	6,100	6
gton	33.0	5,560	1	Des Moines	39.7	6,100	2
n	30.5	5,165	1	Clinton	43.5	6,453	9
n City	26.0	4,843	2	Cerro Gordo	37.5	5,882	11
cil Bluffs—see Omaha, r.)							
bove Cities and Cos...	735.7	121,400	23		864.7	137,473	90
Totals					2,276.9	295,328	674

Totals above Cities and Cos...	1,026.1	263,753	3		1,358.6	365,346	5
State Totals					1,983.1	403,014	22
DISTRICT OF COLUMBIA							
Washington	925.0§	219,102	0	D. of C.; Montgomery and Prince Georges, Md.; Arlington and Fairfax‡, Va.	1,336.5	273,308	1
Alexandria, Va.	33.5†	8,025	0				
Totals above Cities and Cos...	958.5	227,127	0		1,336.5	273,308	1
District Totals					925.0	219,102	0
NORTH CAROLINA							
Charlotte	106.0	17,111	1	Mecklenburg	146.2	20,131	1
Winston-Salem	77.4	8,967	0	Forsyth	109.8	11,310	0
Durham	70.0	11,320	0	Durham	80.5	11,654	0
Wilmington	70.0	5,332	0	New Hanover	79.1	6,144	0
Greensboro:	64.0	9,748	0	Guilford	150.6	17,288	0
High Point	40.0	5,832	0				
Raleigh	53.2	5,166	1	Wake	103.4	7,342	1
Asheville	53.0	12,185	1	Buncombe	97.4	14,799	1
Fayetteville	42.0	3,166	0	Cumberland	62.5	4,082	0
Goldsboro	30.0	2,604	—	Wayne	59.2	3,697	2
Rocky Mount	26.0	3,885	1	Edgecombe-Nash	92.8	8,133	1
Totals above Cities and Cos...	631.6	85,316	4		981.5	104,580	6
State Totals					3,347.5	258,380	29
SOUTH CAROLINA							
Charleston	100.0	14,676	0	Charleston	161.8	18,392	0
Columbia	70.0	10,822	1	Richland	117.2	12,781	2
Greenville	38.2	8,927	1	Greenville	140.4	18,592	4
Spartanburg	36.0	7,390	1	Spartanburg	121.5	12,570	1
Sumter	26.5	3,706	—	Sumter	49.2	4,643	1
Totals above Cities and Cos...	270.7	45,521	3		590.1	66,978	8
State Totals					1,789.9	168,980	43
GEORGIA							
Atlanta	332.5§	51,424	0	De Kalb, Fulton	486.4	66,392	1
Savannah	135.0	22,198	0	Chatham	150.1	23,482	0
Macon	75.0	11,550	0	Bibb	101.8	13,748	0
Augusta	73.5	8,593	0	Richmond	88.9	8,981	0
Columbus	60.0	9,989	0	Muscogee, Ga.; Russell, Ala.	136.0	12,825	0
Albany	29.1	2,930	—	Dougherty	31.0	2,994	1
Rome	26.9	4,278	0	Floyd	53.2	5,191	0
Athens	24.5	4,130	—	Clarke	26.8	4,416	1
Totals above Cities and Cos...	756.5	115,092	0		1,074.2	138,029	3
State Totals					2,976.3	265,505	73
FLORIDA							
Jacksonville	235.9§	27,545	1	Duval	245.1	28,235	1
Tampa‡-St. Petersburg	205.1	25,818	1	Hillsborough and Pinellas	301.4	36,841	1
Miami:	200.0§	32,960	1	Dade	294.4	48,046	2
Miami Beach	31.3	5,543	0				
Pensacola	55.0	7,014	0	Escambia	87.3	8,922	0
Orlando	52.1	6,652	2	Orange	77.3	10,052	2
West Palm Beach	33.7	7,984	0	Palm Beach	80.9	14,508	0
Panama City	33.0	3,450	—	Bay	44.8	3,686	0
Lakeland	25.0	4,211	—	Polk	89.2	12,003	3
Tallahassee	25.0	2,654	—	Leon	36.4	2,867	0
Totals above Cities and Cos...	896.1	123,831	5		1,256.8	165,160	9
State Totals					2,011.7	240,209	19
Region Totals					17,808.7	2,086,872	221

REGION: EAST SOUTH CENTRAL

ALABAMA							
Birmingham	303.0	40,419	0	Jefferson	470.4	55,137	0
Mobile	150.0§	18,755	0	Mobile	227.8	27,322	0
Montgomery	95.0	9,189	1	Montgomery	115.2	10,413	1
Gadsden	42.2	4,874	0	Etowah	77.1	6,720	0
Anniston	38.0	4,273	1	Calhoun	70.6	6,463	1
Tuscaloosa	30.0	4,659	1	Tuscaloosa	68.0	6,527	1
Totals above Cities and Cos...	658.2	82,169	3		1,029.1	112,582	3
State Totals					2,718.2	206,613	41
TENNESSEE							
Memphis	321.9	40,568	3	Shelby	378.1	43,071	4
Nashville	174.1	28,216	1	Davidson	261.3	34,561	2
Chattanooga	135.0	21,586	0	Hamilton, Tenn.; Walker, Ga.	208.4	27,522	0
Knoxville	135.0§	22,720	2	Knox	195.5	27,164	2
Jackson	32.2	4,066	—	Madison	53.3	4,791	1
Johnson City	29.0	3,862	0	Washington	50.6	4,536	0
Kingsport	28.0	2,830	0	Sullivan	77.5	6,406	0
Totals above Cities and Cos...	855.2	123,848	6		1,224.7	148,051	9
State Totals					2,818.4	235,417	70
KENTUCKY							
Louisville:	365.0§	64,076	0	Jefferson, Ky.; Clarke and Floyd, Ind.	508.8	76,309	4
New Albany, Ind.	30.0	4,039	0				
Lexington	53.0	9,477	1	Fayette	77.1	10,147	1
Paducah	35.5	5,927	1	McCracken	42.8	6,534	1
Owensboro	33.0	4,922	1	Daviess	49.2	5,906	1
(Ashland—see Huntington, W. Va.)							
(Covington—see Cincinnati, O.)							
(Newport—see Cincinnati, O.)							
Totals above Cities and Cos...	516.5	88,441	3		677.9	98,896	7
State Totals					2,549.5	245,885	63
MISSISSIPPI							
Jackson	69.9	11,104	1	Hinds	110.8	12,505	3
Meridian	40.0	5,693	1	Lauderdale	57.0	5,761	1
Gulfport	30.0	2,269	—	Harrison	65.5	5,604	1
Vicksburg	26.1	4,308	—	Warren	36.1	4,736	1
Greenville	25.0	3,377	—	Washington	62.8	5,834	4
Biloxi	25.0	1,955	—	Harrison (see above).			
Totals above Cities and Cos...	216.0	28,706	2		332.2	34,440	10
State Totals					1,996.1	130,575	64
Region Totals					10,982.2	818,490	238

Great Falls	33.0	5,917	2	Cascade			
Billings	25.1	5,256	—	Yellowstone	37.9	6,033	9
Totals above Cities and Cos...	103.4	20,826	6		126.3	24,236	18
State Totals					470.3	75,950	139
IDAHO							
Boise	30.0	7,120	6	Ada	49.1	8,751	12
State Totals					473.3	68,421	148
WYOMING							
Cheyenne	33.0	5,783	—	Laramie	37.6	6,329	6
State Totals					235.7	37,460	53
COLORADO							
Denver	335.4	63,300	3	Denver, Arapahoe and Jefferson	405.4	70,532	12
Pueblo	58.0	7,759	6	Pueblo	73.3	8,150	8
Colorado Springs	45.0	9,237	2	El Paso	61.2	10,261	3
Totals above Cities and Cos...	438.4	80,296	11		539.9	88,943	23
State Totals					1,067.3	154,587	125
UTAH							
Salt Lake City	178.9	34,918	8	Salt Lake	230.4	41,630	16
Ogden	65.0§	12,617	4	Weber	70.2	13,332	7
Provo	25.1	2,850	—	Utah	68.4	5,425	11
Totals above Cities and Cos...	269.0	50,385	12		368.8	60,387	34
State Totals					583.4	79,256	77
NEVADA							
Reno	25.5	8,321	—	Washoe	35.8	10,661	4
State Totals					130.6	28,384	5
ARIZONA							
Phoenix	87.7	17,281	1	Maricopa	206.1	31,242	7
Tucson	47.0	12,384	0	Pima	88.5	18,070	0
Totals above Cities and Cos...	134.7	29,665	1		294.6	49,312	7
State Totals					569.3	74,901	9
NEW MEXICO							
Albuquerque	40.0	8,604	2	Bernalillo	69.8	10,167	2
State Totals					490.0	50,792	18
Region Totals					4,019.9	569,751	574

REGION: PACIFIC

CALIFORNIA							
Los Angeles:	1,825.0	341,802	9	Los Angeles and Orange	3,292.1	631,724	57
Alhambra	42.0‡	11,097	1				
Belvedere	37.2†	4,609	0				
Beverly Hills	33.0	13,767	1				
Burbank	56.0	6,020	1				
Glendale	100.0	23,179	1				
Huntington Park	28.6†	6,599	0				
Inglewood	38.2	6,447	0				
Long Beach	225.0§	51,048	2				
Pasadena	92.0	21,950	1				
Pomona	27.0	5,787	—				
Santa Ana	44.0	8,853	4				
Santa Monica	64.0	14,224	1				
South Gate	42.0‡	6,965	0				
San Francisco-Oakland:	1,189.4§	271,769	5	Alameda, Contra Costa, San Mateo, San Francisco, Marin, Solano	1,925.1	401,672	19
Alameda	43.7	8,559	0				
Berkeley	111.1	25,250	2				
Richmond	110.0	15,483	—				
San Mateo	25.3	6,427	—				
Vallejo	35.0‡	6,792	—				
San Diego	320.0§	82,907	2	San Diego	450.0	111,832	10
Sacramento	106.5	25,209	3	Sacramento	188.2	30,966	9
San Jose	80.5	23,727	1	Santa Clara	191.8	43,017	15
Stockton	70.0	14,468	5	San Joaquin	151.8	23,544	17
Fresno	65.5	21,534	7	Fresno	194.7	37,230	19
San Bernardino	60.8	10,285	3	San Bernardino	135.1	27,494	8
Riverside	49.4	7,564	3	Riverside	122.2	20,722	11
Santa Barbara	40.0	11,676	2	Santa Barbara	74.6	16,936	4
Bakersfield	32.0	11,888	4	Kern	141.5	28,722	9
Totals above Cities and Cos...	4,993.2	1,065,885	58		6,917.1	1,373,909	178
State Totals					8,039.3	1,605,118	329
WASHINGTON							
Seattle:	480.0	114,806	22	King, Kitsap‡	686.5	146,912	63
Bremerton	62.0	7,228	—				
Spokane	145.6§	30,156	7	Spokane	172.4	35,746	29
Tacoma	142.0	37,650	12	Pierce	209.0	50,211	26
Everett	35.0	12,067	7	Snohomish	91.0	20,454	28
Yakima	34.8	12,986	6	Yakima	96.7	23,036	34
Bellingham	32.5	9,800	3	Whatcom	54.7	12,936	20
Vancouver	30.0	7,076	—	Clark	94.9	13,226	12
Totals above Cities and Cos...	961.9	231,769	57		1,405.2	302,521	212
State Totals					1,905.5	420,642	459
OREGON							
Portland	407.0§	93,329	14	Multnomah and Clackamas	511.2	107,463	33
Salem	35.5	8,456	5	Marion	72.7	12,603	19
Eugene	26.2	9,015	—	Lane	72.3	16,358	14
Totals above Cities and Cos...	468.7	110,800	19		656.2	136,424	66
State Totals					1,173.2	250,612	274
Region Totals					11,118.0	2,276,372	1,062

NOTES AND ACKNOWLEDGMENTS

*Civil Population, Local Estimate, 1-1-1944.
**OPA Civil Population 2-15-1944.
§12-1-45 Estimate.
†1940 Census.
‡1942 Estimate.
‡County included as in J. Walter Thompson Co. Definition of Metropolitan Market.

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Locker Plant statistics courtesy F.C.A., USDA.

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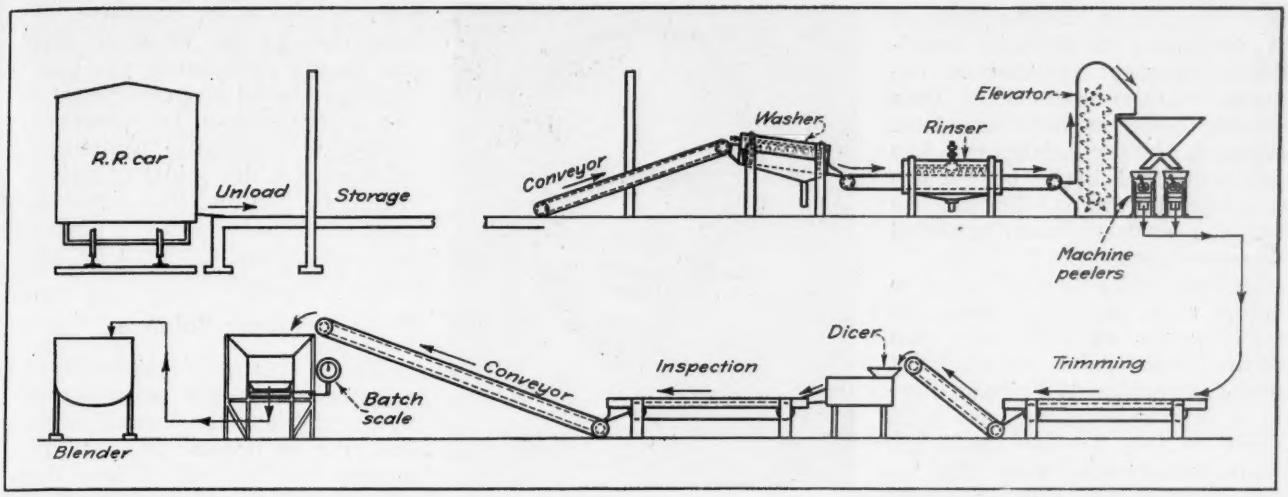


Fig. 1. Flow sheet of a representative food processing operation—the preparation of diced potatoes.

Material Standards For the Food Industries

By establishing material standards, large savings in the purchase of raw materials can be made. Improved methods and machines may increase yields of ingredients and reduce labor costs, thus effecting additional savings

By ROBERT E. WORDEN, Worden and Risberg, Philadelphia, Pa.

IN the average food processing company high costs of prepared ingredients usually result in the boss raising the roof with purchasing and production. Having shaken a finger under the noses of his unfortunate subordinates he then proceeds to sit back confident that this tactic will produce the desired objective, namely, better yields. Taking the various department heads to task for excess ingredient costs may have an effect up to a point but only because people have a tendency to slip occasionally; over a period of time, however, the question of solving the yield riddle goes far beyond the finger-shaking stage.

It is difficult to reconcile the number of companies that have done nothing resembling a thorough and concrete job on what makes yields tick. Apparently some food processors don't realize the extent to which yields can be improved. Why is it that management can tell you immediately the next five years' depreciation on every capitalized item; estimate yearly maintenance expense within allowable limits; have on record, standard times for every measured job in the plant; and yet, for example, not be able to tell which one of 10 carloads of potatoes at varying prices, varieties, sizes, and grades is the best buy in terms of, let us say, 100 pounds diced? A paradox, especially when ingredient costs are the biggest single expense in foods and any reduction, even a small one percentagewise, would stand out like a beacon light in the profit and loss statement. It is high time that food processors cease being complacent over historical costs and adopt a program for developing material standards. Once accomplished, the manufacturer will have a life-line against excessive ingredient costs, which too often create discouraging prospects for future development.

How to Proceed

There is only one way to do this —*search*. The facts are in your plant already but only search will bring them out. Search, plus a lot of imagination, ingenuity and perspiration.

I can hear some readers muttering to themselves, "We tried something like that once; but every time we were going places another variable came along and threw us off." To those readers I can say simply this, it is being done today by progressive food companies who have come to regard their control of ingredient costs as one of their most important functions. In those companies, purchasing, production, engineering, product research, accounting and, in fact, almost every

major division of the business use the findings of the Material Standards Department to excellent advantage. Lower costs have been achieved, better methods have been developed, better equipment has been discovered, better buying has resulted and better quality also has been the answer—even improved manpower utilization.

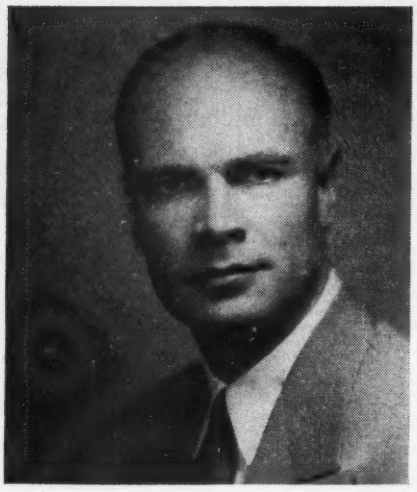
Can any food processor afford to neglect such an opportunity for cost reduction, an opportunity that has always existed in his plant but never fully explored? Perhaps there are a few who are satisfied with things as they are but there are hundreds more who realize that future existence and prosperity rest mainly on one lone factor—*costs*. What better way to start cutting costs than with the ingredients themselves, the raw materials, which in food processing are often 75 percent of the total cost of goods sold.

The Scope

Obviously, some ingredient materials do not lend themselves to noticeable cost reduction other than that achieved through astute purchasing. Examples are such standard items as sugar, spices, dried peas and beans, grains, flours and fats. Other materials, however, are bought and received "on the hoof" so to speak, and undergo preparing operations both by machine and by hand with the result that the net yield at the blending stage may be as low as 20 percent of the purchased quantity. Examples are tomatoes, turnips, carrots, cabbage, potatoes, celery and other vegetables, as well as meats, poultry and fruits. In most food companies, these and other similar items comprise a large percentage of total ingredient cost, and it is here where new economies, once effected, are as good as money in the bank.

The Approach

Conducting research on yields is like building a house—we must start at the bottom and work up and out. The initial step in material standardization, therefore, is to establish in record form, what varieties, sizes, and grades of the ingredient are now being used; what preparing operations are involved; direct labor cost by operator; material losses in yield by operation; net yield at the blending stage and total cost of the final prepared ingredient. For this a process chart is first prepared; then



Robert E. Worden, the author, a graduate of Massachusetts Institute of Technology, was formerly associated with a large eastern processor where he worked out a program of Material Standardization.

test runs are made of the varieties, sizes, and grades customarily processed. These will reveal in each case:

1. Ingredient losses by operation
2. Machine times required
3. Labor hours required
4. Net yield at final stage

We can establish comparative costs under the present processing procedure by totaling:

1. Purchase price, including freight, warehousing, and incidental expense
2. Machine cost
3. Labor cost

The resulting sum divided by the net yield percentage will give total cost in terms of net prepared weight.

We now have a basis for defending contemplated purchases of new or different varieties, sizes, and grades; changes in methods and/or procedures and purchases of new equipment. If total prepared cost of an item at a certain purchased price is $4.52 per 100 lb., then it can be established if a change in method will reduce direct labor cost or improve the yield; if a new type machine will bring about a greater yield, or perhaps even a lower yield offset by substantially less direct labor cost in succeeding operations; if a different variety would be more economical; if concentrating on one particular size, market conditions permitting, would effect a saving; or if a combination of all these factors would bring about the optimum processing results. In other words, we have, up to now, been working in a more or less static condition. We have held to the varieties, sizes, and grades customarily purchased, often purchased on price alone; we had to conform to the processing procedure currently established; we worked with equipment without regard for the fact that it may not have been the best for our purpose. So here we go in search of what might have been.

Proper Balance

We are constantly looking for the proper balance—the price we pay on the market; the ingredient loss incurred in process and the preparing cost involved. These three factors maintained on an even keel will give us the lower costs we are after. We must test all acceptable variations in ingredients to find the one most economical in the final analysis. We must continue to look for equipment that will either improve yields, reduce labor expense, or perhaps achieve both of these objectives. We must seek better methods for preparing materials, be they vegetables, meats, poultry or fruits. There is an optimum point to be arrived at in every case —it must be found if the company is to remain on a competitive basis.

A detailed study of a processed ingredient will reveal much useful information. Let us consider the potato as an example. The same approach and results can be realized on almost any ingredient material that undergoes a transformation in the cycle of preparation.

A process chart on preparing potatoes is given in Fig. 1.

All available varieties must be considered, including Sebago, Chippewa, Katahdin, Russet, Cobbler, Green Mountain, White Rose, Warba and others.

Tests for yield are given in Table I. The varieties show important differences.

TABLE I—Tests For Yield Only

Variety	No. potatoes per lb.	Texture factor	Yield percent
A.....	3.0	4.0	81.1
B.....	3.0	4.0	79.7
C.....	3.0	4.0	78.5
D.....	3.0	4.0	76.1

This does not, however, indicate that variety A is the most economical purchase; the original market price plus preparing cost will be all-important in determining the best buy.

Test for differentials in preparing cost among varieties will give tangible results: see Table II.

Analysis will further show that

the most economical varieties to process are machine-peeled in the shortest time. This is a definite advantage when the schedule is heavy since taxing machine capacity eventually results in curtailment of production or forces extra capital investment in additional peelers. Further test runs will show considerable variation in total prepared cost due to varietal characteristics. See Table III. Differences in prepared costs are caused by the contour, number of eyes, and depth of eyes which characterize each variety.

Effect of Size

The effect of size variation on yields is also important. Making test runs at a constant peeling time will indicate the best size on which to concentrate, everything else being equal. See Table IV.

TABLE IV—Effect of Size on Yield

Size	Percent			
	Loss in peeling	Loss in paring	Rej.	Yield
A	10.0	6.9	2.0	81.1
B	10.0	7.5	2.0	80.5
C	10.0	9.0	2.0	79.0
D	10.0	11.1	2.0	76.9
E	10.0	13.8	2.0	74.2

It has been observed that potatoes having a high texture factor are brittle and have a tendency to chip in abrasive-type peeling machines. Tests of potatoes of the same variety but different texture values would show noticeable changes in yields. See Table V.

TABLE II—Cost of Preparing Potatoes

Variety	No. per lb.	Percent				Preparing cos 100 lb. net	
		Peeling loss	Paring loss	Rej.	Yield	gross	final
A	3.0	4.8	10.2	2.0	83.0	$1.037	$1.249
B	3.0	9.6	8.5	2.0	79.9	1.056	1.321
C	3.0	11.9	9.6	2.0	76.5	1.085	1.417

TABLE III—Total Prepared Cost

Variety	Percent				Cost por 100 lb.	
	Loss in peeling	Loss in paring	Rej.	Yield	Gross	Prepared
A	9.5	7.4	2.0	81.1	$3.02	$3.72
B	11.1	7.2	2.0	79.7	3.08	3.88
C	11.6	7.9	2.0	78.5	3.12	3.97
D	12.6	9.3	2.0	76.1	3.15	4.14

The net result of the above studies indicates that the ingredient—by varieties, sizes, and grades—will classify itself as to desirability of purchase when contrasted with fluctuating market prices. The variety, size, and grade giving the highest yield obtainable at the lowest processing cost may not be the best buy if the price is "out of sight." It could happen that another variety with, perhaps, a low yield factor and high preparing cost would be a far better buy in the prepared state provided the original cost was favorable. But how is the purchasing agent to know which from what? If left to his own devices he will probably buy what looks like the best choice.

TABLE V—Effect of Texture Upon Yield

Texture	Percent rej.	Pot./lb.	Percent		
			Loss in peeling	Loss in paring	Yield
2.0	2.0	3.4	10.0	8.3	79.7
6.0	2.0	3.4	10.0	9.7	78.3
10.0	2.0	3.4	10.0	10.5	77.5
14.0	2.0	3.4	10.0	11.6	76.4

Establishment of material standards will result in having purchasing performed with a view to total prepared cost—certainly the only logical way. Furnishing the purchasing department with control charts will provide the tools required to do a better job. Table VI shows a typical chart used by one nationally known company in establishing purchasing standards for all its processed ingredient materials.

Does It Pay?

Does research into material standards pay off? Well, one-food manufacturer made a $25,000 annual saving by concentrating purchases on a variety previously neglected. It was also found that additional worth while economy could be effected by buying one specific size as often as possible, price and texture being equal. Furthermore, material standards re-

(*Continued on page* 216)

TABLE VI—Potato Purchase Control Chart

No. per lb.	$1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45
							Potato A									
							Purchase Cost—100 lb.									
							Prepared Cost—100 Lb. Diced									
3.0	2.82	2.87	2.93	2.99	3.05	3.11	3.17	3.23	3.29	3.35	3.41	3.47	3.54	3.59	3.65	3.71
3.5	2.86	2.91	2.97	3.03	3.09	3.15	3.21	3.27	3.34	3.40	3.45	3.52	3.59	3.65	3.70	3.76
4.0	2.90	2.95	3.01	3.07	3.14	3.20	3.26	3.32	3.38	3.44	3.50	3.57	3.64	3.69	3.75	3.81
							Potato B									
							Purchase Cost—100 lb.									
	$1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45
							Prepared Cost—100 lb. Diced									
3.0	2.90	2.96	3.02	3.08	3.15	3.21	3.27	3.33	3.40	3.46	3.52	3.59	3.66	3.71	3.76	3.82
3.5	2.95	3.01	3.08	3.14	3.20	3.26	3.33	3.39	3.45	3.51	3.58	3.65	3.72	3.77	3.83	3.89
4.0	3.00	3.06	3.13	3.19	3.25	3.31	3.38	3.44	3.51	3.57	3.64	3.71	3.78	3.83	3.89	3.95
							Potato C									
							Purchase Cost—100 lb.									
	$1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45
							Prepared Cost—100 lb. Diced									
3.0	3.00	3.06	3.13	3.19	3.26	3.32	3.38	3.44	3.50	3.56	3.63	3.70	3.77	3.82	3.88	3.94
3.5	3.05	3.11	3.18	3.24	3.30	3.36	3.42	3.48	3.55	3.61	3.68	3.75	3.82	3.87	3.93	3.99
4.0	3.09	3.14	3.20	3.27	3.34	3.40	3.47	3.53	3.60	3.66	3.73	3.80	3.87	3.92	3.98	4.04
							Potato D									
							Purchase Cost—100 lb.									
	$1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45
							Prepared Cost—100 lb. Diced									
3.0	3.03	3.09	3.16	3.22	3.28	3.34	3.40	3.46	3.53	3.59	3.65	3.72	3.79	3.84	3.90	3.96
3.5	3.08	3.14	3.21	3.27	3.33	3.39	3.45	3.51	3.58	3.64	3.71	3.78	3.85	3.90	3.96	4.02
4.0	3.13	3.19	3.26	3.32	3.39	3.45	3.51	3.57	3.64	3.70	3.77	3.84	3.91	3.96	4.02	4.08
							Potato E									
							Purchase Cost—100 lb.									
	$1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45
							Prepared Cost—100 lb. Diced									
3.0	3.24	3.30	3.36	3.43	3.50	3.56	3.63	3.69	3.76	3.82	3.89	3.96	4.04	4.09	4.15	4.21
3.5	3.28	3.34	3.41	3.47	3.54	3.61	3.68	3.74	3.81	3.87	3.94	4.01	4.09	4.14	4.20	4.26
4.0	3.32	3.39	3.46	3.52	3.59	3.64	3.72	3.79	3.86	3.92	3.99	4.06	4.14	4.19	4.25	4.31

Using Soybean Lecithin In The Macaroni Industry

PART I—Lecithin can be added in the form of a premix in manufacturing macaroni products without impairing processing efficiency. Oxidation of pigments is retarded, resulting in greater retention of the yellow color

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DURING the past few years, commercial soybean lecithin has played an important part in processing confectionery, oleomargarine and bakery products. It was therefore deemed of sufficient interest and importance to determine the effects of small quantities of commercial lecithin in the processing of macaroni products.

Accordingly, a study was undertaken to determine the effects of 0.5 percent soybean lecithin in macaroni products, manufactured on a commercial scale. Studies involving lecithinized macaroni products included: (1) the practicability of manufacturing, (2) effects of lecithin on the quality in terms of color, (3) effects of lecithin on the quality indicated by changes in mechanical strength, (4) cooking properties and their appeal to the consumer, (5) the role of lecithin in preserving cooked macaroni products, (6) the vitamin B-1 retention after cooking, and (7) the iodine number. Soybean lecithin used throughout this study consists of the commercial grade Yelkin BTS, composed of 65 percent lecithin and 35 percent vegetable oil carrier. "Soybean lecithin" will be referred to as "lecithin" throughout the text and as "Yelkin BTS" in tables.

A. Zerega's Sons Inc. photo

By using automatic, continuous mixers, the flour or semolina is thoroughly mixed with water. The finished mix is then transferred directly into the kneading chamber.

Processing With Lecithin

Preliminary experiments were conducted to determine the quantity of lecithin and the best way to incorporate it in farinaceous ingredients (semolina, farina, flour) so as to promote uniform distribution. It was decided that 0.5 percent of lecithin would be most feasible from a practical and economic point of view, and that a lecithin-flour premix would best serve the purpose of uniform distribution.

A lecithin premix was prepared by incorporating 300 lb. of flour with 100 lb. of lecithin. This was done in the regular flour mixer. The time required for a homogenous mix was 15 minutes. This yielded a product containing 25 percent lecithin by weight. Appropriate scoops with a capacity of 3 lb. were used in all manufacturing experiments. The introduction of 3 lb. of the premix to 140 lb. of semolina or flour in a mixer yielded a finished spaghetti product containing the required 0.5 percent of lecithin.

The manufacture of lecithinized spaghetti continued for a period of two months and included the following steps which were all thoroughly investigated: (1) mixing, (2) kneading, (3) extruding, (4) drying, and (5) packaging.

The above stages of production were observed carefully for the duration of the experiment, and the men in the various departments were questioned as to any discernable differences between the plain and lecithinized products. Results, formulated after conferring with

all workers day after day are given in Table I.

Results showed the manufacture of spaghetti containing 0.5 percent lecithin is practicable with no impairment in efficiency. Lecithin can be introduced in the normal course of spaghetti manufacture by means of a lecithin-flour premix without disrupting any stages in the processing. The finished lecithinized spaghetti presents a better appearance, owing primarily to its greater degree of brightness and uniformity.

The promulgation of War Food Order No. 144, effective March 1, 1946 required the use of 80 percent extraction flour in the manufacture of macaroni products. Consequently, experiments were made to determine the effect of lecithin on macaroni products, using 80 percent extraction flour. In addition, an experiment was conducted in another large macaroni plant to determine whether results obtained in one plant would parallel those obtained in the other.

After one month of almost continuous manufacture, it was noted that results were in accord with those previously obtained. There was, however, a greater contrast in color and appearance between the finished lecithinized spaghetti containing the 80 percent extraction flour and control than between the finished lecithinized spaghetti using regular grade semolina and its control. This is apparently due to the greater effect of the antioxidant properties of lecithin on low grade flours. These flours contain more oxidases and peroxidases, owing to the presence of bran and offal. The results obtained in both plants checked with each other despite the slight differences in plant practices.

TABLE I—Effects of 0.5 Percent Lecithin in Manufacturing Spaghetti

Stage of processing	Observations
Mixing	No apparent change. Premix blended easily with the farinaceous ingredients without affecting mixing time.
Kneading	Lecithin slightly superior in the formation of a smooth and uniform dough.
Extruding	Very little difference noted. Slightly less pressure required to extrude the lecithinized dough. Slightly more care required in placing the lecithinized spaghetti strands on the drying sticks.
Drying	No difference in drying time between plain and lecithinized spaghetti. Latter products appeared brighter with a greater degree of smoothness.
Packaging	"Scrappings" or broken spaghetti, which resulted from handling by the packers, remained the same with both types of products. The difference in appearance was noted by all the packers. Lecithinized product preferred.

TABLE II—Color Losses During Spaghetti Manufacture With Different Grades of Farinaceous Ingredients

Product	Ash	Color p.p.m.*	Loss in color, percent
Semolina	0.67	4.56	
Spaghetti		3.65	20.0
Durum Flour	0.75	4.28	
Spaghetti		2.75	37.0
Durum Flour	1.01	5.90	
Spaghetti		1.30	72.4
Durum Flour	1.45	5.19	
Spaghetti		1.29	75.2
Durum Flour	1.86	4.83	
Spaghetti		0.93	80.7

*Carotenoid pigments in parts per million.

Importance of Color

Color in macaroni products has always been considered the most important criterion in evaluating quality, LeClerc[1], Fifield, Smith and Hayes[2]; Binnington and Geddes[3]; Binnington, Johannson and Geddes[4]; Harris, Smith and Sibbitt[5]; and Hetherington and Smith[6].

In commercial practice, there is a substantial reduction in color during the drying stages. This is due primarily to the oxidation of pigments such as xanthophyll and carotene. These pigments are autooxidizable and tend to bleach on exposure to the air[7]. This condition is intensified because of forced air circulation during the drying operation. Oxidases are present in agricultural products, particularly in the form of peroxidases which contribute to the oxidation and reduction of the yellow pigments[8]. The lower the grade flour used in the manufacture, the more active will be the enzymatic action and the greater the destruction of the pigments originally present in farinaceous ingredients. This will also have a significant effect on the reflected color of the finished product, as measured both by the eye and disk colorimetry.

Color examination of various grades of durum flours and the corresponding manufactured macaroni products has shown in this laboratory yellow pigment losses to the extent of 80.0 percent. Losses vary from 20 to 80.7 percent, depending upon the grade of farinaceous ingredient used in manufacture.

Color Differences

During the experiments it was evident to the employees of the manufacturing plant and the investigators that a noticeable color difference existed between plain and lecithinized spaghetti. This led to experiments dealing with color measurements in terms of carotenoid pigment content and the amount of reflected light by means of disk colorimetry.

Lecithin, as an antioxidant, has proved efficient, especially when used in conjunction with oils and fats in proper ratio[9]. Olcott and Mattill concluded that the antioxygenic action was due essentially to the presence of cephalin[10]. Harrel and Brown found that the presence of 0.5 percent lecithin had a very substantial effect on the keeping quality of mill products[11]. Riemenschneider and Ault found that lecithin, used with tocopherol or polyphenolic antioxidants, frequently enhanced the stability of food products beyond expected values[12].

Color Tests

The method used to determine carotenoid pigments was based on procedures advocated by Ferrari and Bailey[13] and Munsey[14]. The transmittency of the extracted solutions was obtained on a Hellige Diller Photo-Electric Colorimeter, using a 440 filter. Results were reported in terms of carotene. Light reflected from spaghetti products was measured by means of an N-A Wallace and Tiernan Color Analyzer. This involves disk colorimetry used in this laboratory for the past ten years. According to Nickerson, disk colorimetry represents a reliable method of measuring color of agricultural products, particularly when done by an experienced operator[15]. Results obtained by means of disk colorimetry can be translated in terms of Munsell

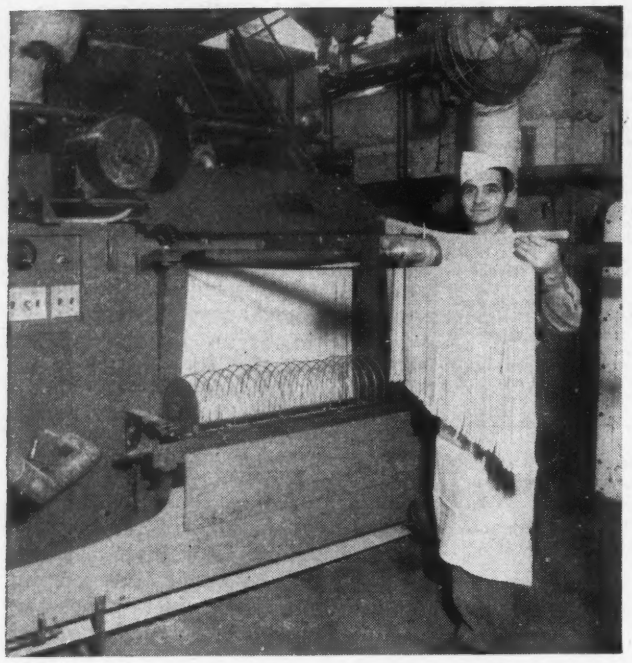
TABLE III—Effect of Lecithin on Color Retention

Product			Yellow, percent**	Brown, percent**	Color, p.p.m.*	Color retained, percent
Lecithin premix			31.0	56.0	10.00***	
Semolina blend	(A)		35.0	8.0	3.61	100.0
	(B)				3.48	100.0
(A) Spaghetti (Control)		(1)	27.6	9.7	2.89	80.0
		(2)	29.0	12.0	3.18	88.1
		(3)	27.0	8.0	2.70	74.8
(A) Spaghetti (Yelkin BTS)		(1)	29.9	8.3	3.18	88.1
		(2)	31.0	10.0	3.48	96.4
		(3)	28.0	6.0	2.97	82.3
(B) Spaghetti (Control)		(1)	22.3	11.7	1.04	29.9
		(2)	25.0	15.0	1.14	32.8
		(3)	20.0	10.0	0.88	25.3
(B) Spaghetti (Yelkin BTS)		(1)	24.8	10.5	1.51	43.1
		(2)	27.0	13.0	1.66	47.7
		(3)	22.0	9.0	1.31	37.6

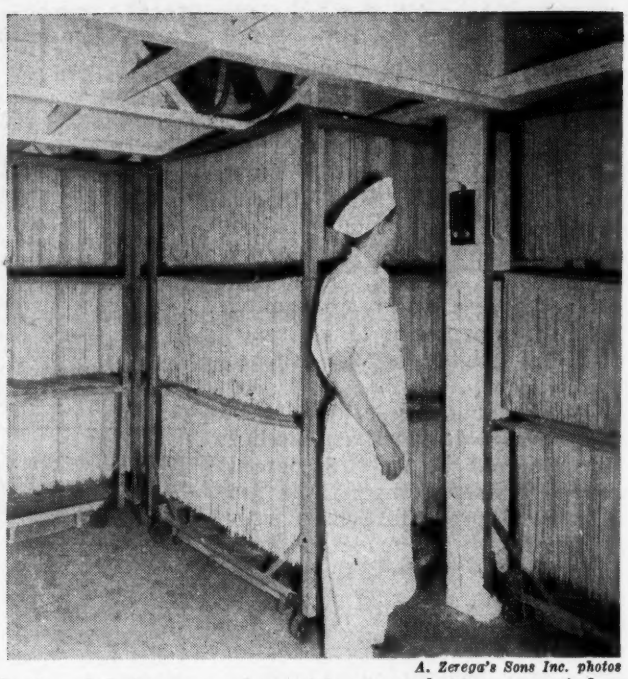
(A) 72 percent extraction
(B) 80 percent extraction

(1) Average of 10 samples
(2) Maximum
(3) Minimum

* Carotenoid pigments in terms of carotene, p.p.m.
** Color measured by means of Wallace and Tiernan color analyzer.
*** Yellow pigments measured chromatographically 16.



After mixing and kneading, the spaghetti is extruded on a continuous press, which is equipped with an automatic spreader.



A. Zerega's Sons Inc. photos

Section of drying room where sticks of spaghetti are mounted on trucks and subjected to drying or curing process.

values, or in terms of dominant wave length and purity recommended by the International Commission of Illumination[16].

Results of a large number of spaghetti products manufactured commercially with and without lecithin are shown in Table III. Carotenoid extraction and disk colorimetry results show that where 0.5 percent of lecithin was added, there was a definite improvement in the brightness of the product, measured by the percentage of yellow and also by the carotenoid pigments. The percentage of brown (red plus black) represents an index of purity or cleanliness. The higher the percentage of brown, the poorer the purity, with a corresponding increase in occlusion of the desirable yellow color.

Color index tests, as measured by disk colorimetry, on ingredients and finished products were made in the following manner: Macaroni products were ground and sifted on a Ro-Tap Tyler Sifting Machine for two minutes. Particles passing through a 40- and remaining on a 60-mesh screen were tested by a Wallace & Tiernan Color Analyzer. Farinaceous ingredients (72 percent extraction) were tested in the same manner, except that grinding was not necessary. This color index test could not be applied to 80 percent extraction ingredients, because a substantial percentage passes through a 60-mesh screen.

Color contrast in lecithinized products, however, was more apparent to the eye. Use of 0.5 percent of lecithin tended to create physical and chemical changes in the dough during processing due to its emulsifying and antioxidant properties. It resulted in a finished product with more luminous reflectance or brightness and greater translucency. On the other hand, the lecithin premix showed an undesirable quantity of brown because of the presence of vegetable oil serving as the vehicle for the distribution of the phosphatides in commercial lecithin[17].

Resistance to Breakage

All products were manufactured under strict supervision, and made from the same farinaceous ingredients. The same mixer, kneader, hydraulic press and drying room were used throughout. Pressure during extrusion was maintained at the same level. Hence, the better retention of color during processing, the greater translucency and better color to the eye were due to the addition of 0.5 percent lecithin to the spaghetti products.

The question of mechanical strength of the macaroni product is regarded as a criterion of its quality. According to LeClerc, a good macaroni product should be capable of being considerably bent and should be hard, brittle, translucent and elastic[1].

Consequently, the effect of lecithin on the mechanical strength of macaroni products was evaluated. A number of samples of spaghetti, with and without the addition of 0.5 percent lecithin, was manufactured on a commercial scale. These products were examined for relative breaking strength.

The following procedure for determining breaking strength in macaroni products was devised by this laboratory. The strength was determined by its resistance to breaking:

A glass rod is attached firmly to one end of each of two wooden blocks (4 in. x 4 in. x 8 in.). These are placed on end, parallel to each other and 6 in. apart. Ten of the straightest macaroni sticks are selected at random for each test. A stick of macaroni is placed across the rods and weights (in grams) are applied at the center (3 in. from each end of the glass rod) until the breaking point is reached. The average breaking strength (in grams) is taken as the breaking strength of the product. Individual breaking tests seldom vary more than 10 percent in the same samples.

Results of tests for breaking strength of plain and lecithinized

TABLE IV—Breakage Resistance of Plain and Lecithinized Spaghetti

Product	Breaking strength, grams		
	Average of ten samples	Maximum	Minimum
Spaghetti (Control)	66.7	77.1	53.1
Spaghetti (Yelkin BTS)	65.2	76.9	52.1

spaghetti in Table IV indicate a tendency of the lecithinized product to show a slightly lower relative resistance to breaking, which would point to a very slight reduction in mechanical strength. It is unlikely, however, that during the normal course of manufacturing and transporting, such a reduction of mechanical strength would have any significant effect.

"Droppings" During Drying

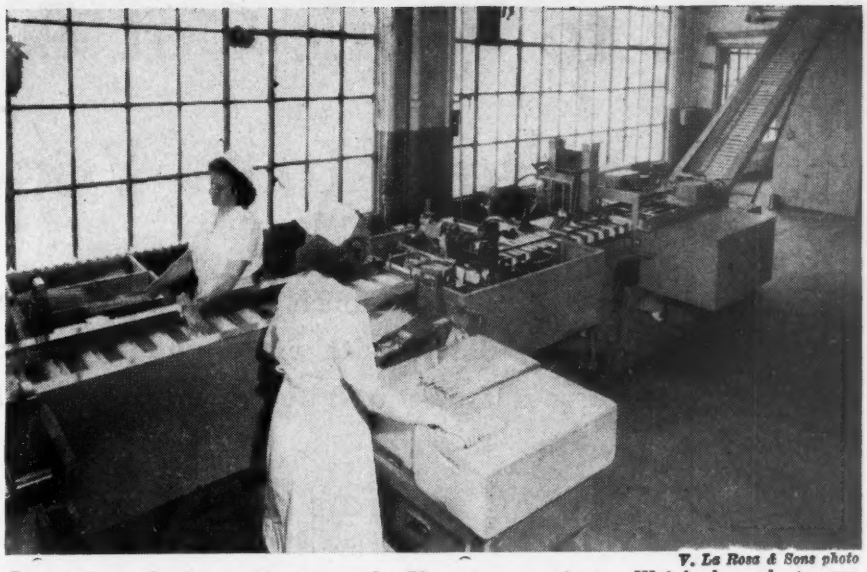
During the manufacture of lecithinized and plain macaroni products, an investigation was made to determine the amount of "droppings" occurring during the actual drying process. "Droppings" in the macaroni industry refers to the amount of long spaghetti or macaroni which accumulates on the bottom of drying trucks during drying. This is due to poor drying practices leading to checking or case hardening and also poor cohesive quality of the farinaceous materials.

A large number of drying trucks containing plain and lecithinized spaghetti was properly marked for identification before being placed in the drying rooms. It was necessary to place the drying trucks, representing each day's experimental run in the same drying rooms in order to maintain similar drying practices.

A drying truck generally consists of 60 rods or sticks, with each stick holding approximately 4½ lb. in the dry state. The total weight of a truck of finished goods is about 270 lb.

All trucks were swept clean before loading, since droppings had to be weighed at the end of the drying process. The time required to complete this investigation was approximately one month and the trucks examined were representative of 100,000 lb. of spaghetti.

Examination of 20 trucks of plain spaghetti and 20 trucks of spaghetti with 0.5 percent lecithin showed more droppings where lecithin was used. Average droppings for the control spaghetti per truck was 12 oz., equivalent to 0.28 percent of total weight. Average droppings for lecithinized spaghetti per truck amounted to 14.7 oz., equivalent to 0.34 percent of total weight. The lecithinized products therefore showed an increase in droppings of 0.06 percent over the control spaghetti. Results, however, obtained in both cases showed that there was very little macaroni product lost during the drying process and the difference between the droppings of these two types of products was not significant from the manufacturing point of view.



V. La Rosa & Sons photo

Automatic packaging equipment packs 70 cartons a minute. Weighed products are mechanically inserted into cartons, sealed and conveyed to the shipping department.

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Measurements of the reflected color of macaroni products are made by grinding the finished material, sifting through 40- on to 60-mesh screens and testing with disk colorimeter.

How to Work Out A Sanitation Program In A Food Plant*

If food plants wish to establish a thorough sanitation program, qualified specialists from public health or regulatory agencies should be employed. They must have authority and be responsible directly to the top management

By J. LLOYD BARRON, Sanitary Engineer
National Biscuit Co., New York City

SANITATION in food processing plants, as an insistent and continuing concern of management and outside agencies representing public interest, is of comparatively recent origin. Our rising national standards of living, our concepts of cleanliness predicated on the newer principles of environmental health, and the transfer of food processing from domestic and local to industrial and interstate bases, have all combined to make sanitation necessary. Thus far, sanitation has been largely an incidental one in industry. In government, it has been receiving increasing attention and support.

Where and how should sanitation be achieved? The answer is obvious and yet not very clearly perceived. Sanitation can only be achieved within the food plant through positive action by the food plant management or operator.

Inspection by outside agencies can never bring about in the bulk of food plants a satisfactory level of sanitation. It might be possible to establish an ubiquitous and costly bureaucracy of food inspection officials, in the nature of an extension of the Bureau of Animal Industry, and so keep the food industry under constant surveillance. Such a system would be irksome to industry, expensive and inefficient, and contrary to the spirit of American government in which regulation has heretofore been held to the minimum necessary to protect public interest.

Photo by Bachrach

J. Lloyd Barron, the author of this article on food plant sanitation, is a sanitary engineer for the National Biscuit Company.

Sanitation is a function of management. Public health and food regulations place the responsibility there. Management can respond to this responsibility indifferently, haphazardly and under duress, or it can plan and carry out a consistent and alert program adapted to the particular food operation. The latter action is likely to be taken only when management has a clear realization of the importance of sanitation and its specialized function. In food processing, department managers and foremen in charge of various operations are directly responsible for sanitation. But these duties are minor in relation to other functions, and can be slighted or ignored while other major duties are satisfactorily performed. The extent to which sanitation is slighted or sustained depends upon the stress which the upper level of management places upon it, and upon the individual's inclinations and training.

Management's attitude and policy on sanitation is vitally important. Sanitation is essential for quality, and quality control is necessary if standards of this nature are to be maintained. More than a desire and a statement of policy regarding quality, no matter how often reiterated in advertising, are necessary on the part of management if such objectives are to be translated into fact.

Specialization of personnel as a basis for efficient accomplishment has been accepted by the food industry in every aspect of work except sanitation. Food plants have production, advertising, sales, accounting and personnel experts, laboratory chemists, nutritionists and home economists. Rarely is a qualified sanitarian employed.

Sanitation Department

If top management wishes to establish a thorough sanitation program, general directives will not be enough. They must be implemented by competent personnel with authority as well as responsibility. Sanitation must be recognized. A sanitation department must be set up with its head responsible, as are other department heads, directly to top executives. Relegation of a sanitarian to a subordinate position in a food plant will invariably yield disappointing results, both for the individual and for management. Too many vetoes by superiors are likely to smother any constructive ideas before they

* Based on paper presented at meeting of Central Atlantic States Association of Food and Drug Officials.

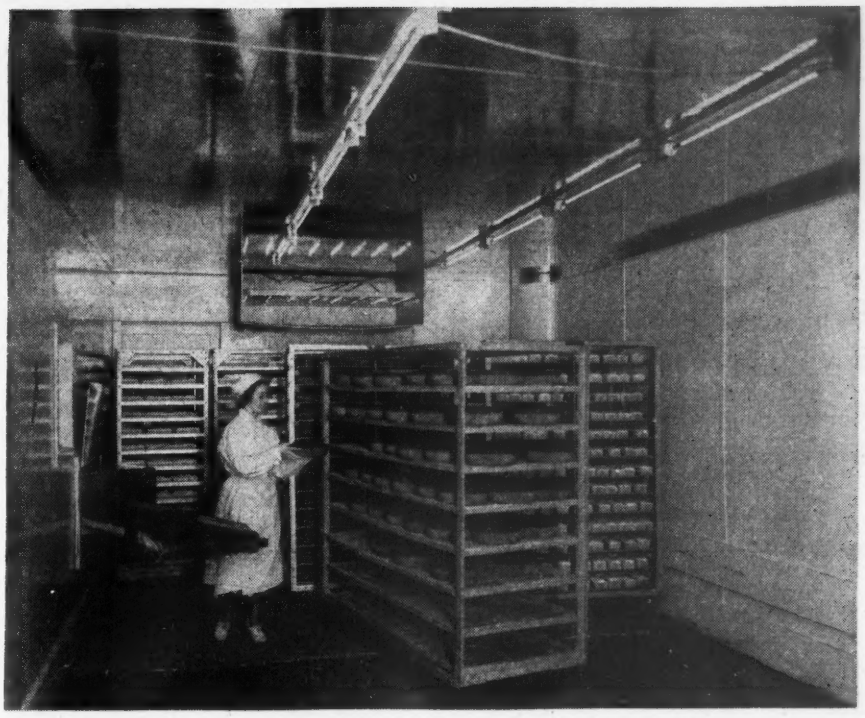
receive proper hearing. Too many recommendations are tabled because they change a routine or require expenditures. Sanitation costs money and effort. If management has not fully accepted and recognized that fact, it must be sold on it from the inside or will learn it through the action of outside official agencies.

Sanitation at management level requires thinking and planning. It must be intelligently applied to every phase of the food business, including the origin of foodstuffs; the storage and protection of bulk food stocks and ingredients; the processing of foods; the design and operation of machinery; the cleaning, maintenance and repair of equipment and buildings; the design and layout of new buildings; the protection of finished and packaged foods; and the plant feeding and provisions for personnel hygiene. An important function for the sanitation department is to maintain an understanding and constructive relationship with official authorities enforcing regulations affecting the company's food business. This also includes active participation in outside professional activities and associations.

Sanitation Personnel

Where should the food industry obtain personnel for food sanitation work? Offhand, it might be assumed that the first qualification should be thorough familiarity with the particular food operation to be given sanitary supervision. To this knowledge could be added a superficial acquaintance with the principles of sanitation to be applied to this operation. It has been demonstrated many times that this combination does not produce the desired results. Long familiarity with the particular food operation and plant may induce a resistance to change and an acceptance of the "status quo" which would prevent an uninhibited appraisal of its sanitary requirements. This is not to say, however, that there is not a broad field for training in sanitation of certain employees in large and small food plants through courses sponsored by health departments and educational institutions.

On the other hand, if specialization is admitted as essential, then persons with maximum training in the theory and the practice of sanitation can be found in public health and food regulatory agencies. If the broad experience of an individual who has competently served in official positions, can be brought to bear intensively on the problems of a food business, a balanced and rational program of sanitary control is most likely to result.



Sterilamps, used in the cooling room of a modern bakery, reduce surface contamination.

In larger units of the food industry, the services of experienced sanitary engineers, sanitarians, and food and drug inspection personnel should be sought to develop and supervise the sanitary aspects of plants and food processing and to assume responsibilities which are now scattered or ignored. In the larger food businesses, the same education and experience would be necessary for the staff required to carry on planning, field control and educational activities. Employment of this type will open new avenues of productive and satisfying professional service to those whose horizons have heretofore been limited to official government positions.

From the standpoint of efficient sanitation in a food plant, an internal staff of sanitarians is better qualified to obtain consistent and far-reaching results than are outside inspecting officials whose work must be sporadic and superficial. Systematic and thorough sanitation requires patient, long range planning and coordination from within the industry as well as the development of a line of authority and responsibility down through plant personnel to the points where the minutiae of sanitary details are actually performed. As the best means of obtaining their official objectives, every health department and food inspection agency should pursue a definite policy of promoting personnel adequately trained in the management of sanitation and of providing intensive instructional and training opportunities for employees who have sanitation duties.

The problems of enforcing food laws and regulations have been complicated and difficult for the enforcing officials. The uncomprehending attitude of some business managements, their lack of organization and lack of technics for meeting sanitary requirements have been responsible. This has led to abrupt and arbitrary enforcement methods and action in many instances. The industry was anxious to conform, but it was not aware of the standards being applied as measures of sanitary quality and not possessed with means or methods of achieving those standards. Reasonable and steady progress toward higher levels of food quality and cleanliness is the real objective, rather than legal punishment of violators and the accumulation of an impressive list of convictions and penalties. It is hoped that, as food plants establish sanitation departments, there will be an increasing measure of frank and constructive cooperation between those privately and those officially employed whose common concern and responsibility to the public are clean, wholesome and safe foods.

Physically Handicapped Make Good Employees

Disabled workers, when given jobs for which they are suited, become dependable employees. Their attendance records should interest food plant managers struggling with help shortages, "floaters" and absenteeism

By MARIJEAN HUTCHISON, Editorial Assistant, "Food Industries" Chicago, Ill.

EMPLOYMENT of crippled or disabled persons in food manufacturing and processing plants has proven to be a sound practice. Surveys have shown that there are fewer accidents and less absenteeism among them than among the general run of factory employees, but industry has been slow to take advantages of these facts. With more and more war-disabled men returning to their jobs, however, management is faced with the question of how to fit them successfully into plant production operations.

Experienced Background

Williamson Candy Co., Chicago, Ill., has a background of experience to help it cope with situations that may arise in connection with its returning veterans. It has employed crippled and disabled persons for a number of years. Individuals having congenital deformities, paralysis victims, spastics, deaf mutes, and persons wearing artificial limbs have been used satisfactorily throughout its plant.

In spite of their disabilities, these employees have shown capabilities and adaptabilities which have enabled them to be moved from one department to another. One girl, paralyzed in both legs has worked in the peanut sorting department, the wrapping department and on radio and radar manufacture during the war. Another girl, paralyzed from the hips down, works in the X-ray department where a physically active individual would become restive and regard the work monotonous. She finds the work fascinating. Deaf and dumb employees work at sealing, mailing and painting boxes for shipment. There is one machine in particular where their disability might become a menace to themselves and to their fellow workers. This is the high-speed wrapping machine for candy bars. If their clothing should become caught in the machinery, or something became wrong mechanically, the mutes would not be able to call out and warn other workers nor to summon help. They are not used on this machine.

In the peanut sorting department 90 percent of those employed have some disability. The workers sit on either side of a movable belt and remove burnt or imperfect peanuts. As this is a sitting job persons having leg or hip deformities work out well. Jobs such as operating automatic lifts for moving boxes, may be performed very well by persons who have lost an arm.

One outstanding example of a skilled workman overcoming a serious handicap, is that of a first-class mechanic who has the use of only one hand and the stub of the other arm. He has so successfully overcome his physical loss that he can repair any piece of machinery in the plant as quickly as many mechanics having the use of both hands. An employee who has both an artificial arm and leg has a highly satisfactory record of performance in the shipping department.

Spastics present the greatest problem of adjustment. They often

In the peanut sorting department workers sit at a well lighted endless belt and remove burnt or shriveled peanuts.

Disabled persons such as deaf mutes, hunch-backs and paralytics work successfully as operators at endless belt feeders.

Repair and maintenance of wrapping and packaging machines are done adeptly and quickly by this mechanic, who has only one hand and the stub of the other arm.

have mental quirks and do not get along well with their fellow workers. Care has to be taken in the selection of other employees to work with them. One highly nervous returned veteran could not adjust himself to any job that was routine. He was finally placed in the shipping department where he does a great variety of tasks and is happily adjusting himself.

Realistic Approach

Williamson Candy Co. makes a positive, and a realistic approach to the employment of physically handicapped individuals. When cripples apply for a job, they are first interviewed by the company nurse to determine the extent of their disability. Many try to hide their disability thinking it will minimize their chance of securing employment. One young man who had a crippled hand kept it in his pocket during the entire interview. The nurse tries to find out what they can do in spite of their particular handicap. The condition of the applicant is then discussed with the head of the personnel department. He and the nurse decide how the individual will best fit into the plant operations. The head of the personnel department always explains the man's disability to the foremen in the department where he will be placed. The foreman in turn studies the man and his responsiveness to the work.

Most of the foremen have a background of experience working with disabled people and know how to handle them. When a particularly difficult individual cannot adjust himself to working in a certain department, he is shifted to another department where he will find entirely different personalities and where, it is hoped, he will find working conditions better suited to his mental and physical capabilities.

The nurse and personnel manager check with the employee from time to time. They also check with the foreman of the department to find out how the man is getting along. Since the adjustment of the new employee is for the benefit of all, other employees are very cooperative. A common characteristic is that, as soon as the physically handicapped person becomes oriented, he is very independent and does not wish help from anyone.

Other Employers

Another food company in Chicago has a very practical program for the placement of returning veterans with special emphasis on the disabled ones. As a result, many veterans with disabilities have been successfully placed in this company's organization. To retain their seniority rating, in the department in which they previously worked, the returnees are placed in the same department wherever possible. One employee was a trucker and hauled heavy loads on a hand truck before he left for military service. While overseas he contracted trench foot with the result that he is not able to be on his feet for long periods. Upon his return he was given a job as a batch scaler so that he can sit down. Another veteran, formerly employed as a steam fitter, came back from the service with a sacroiliac strain. He now works in the same department repairing valves. An employee who formerly stuffed sausage returned with a fractured knee. He is now a clerk and timekeeper in the sausage department.

This company started its preparations through correspondence while the men were still in the Armed Forces. A file is kept on each veteran and a form has been developed to cover pertinent information such as: The date of induction or enlistment; rank; branch of service; months in service; type of service and date of discharge. Also included are: Disabilities incurred in military service; special training; citations and medals received and length and type of employment with the company before entering the service. When a veteran returns, he is given a medical examination to advise the personnel department as to the type of work he will be able to do.

After a man has been placed on a job, his progress is followed by a counselor, who himself is a veteran. The veteran is encouraged to consult his counselor and ask his advice regarding difficulties, whether they be about his job or outside problems.

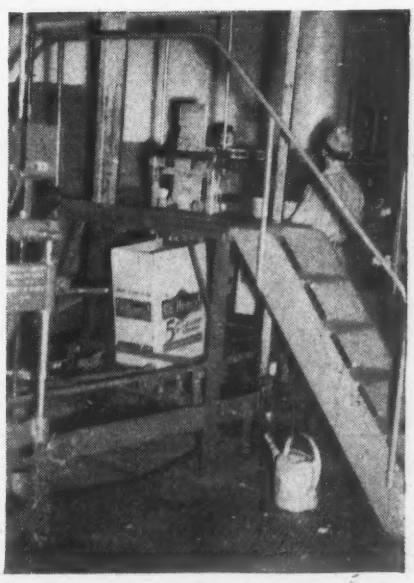
Adjustments at Hospitals

Preliminary to their application for employment most of the disabled veterans have become well adjusted to their disabilities. Some are even cured before they are released from the Army and Navy hospitals. This ability to readjust is due largely to the excellent individualized treatment received in the Occupational Therapy Division of the hospitals. The treatments are fundamental and thorough.

The individual's injuries are examined and specific treatment is devised and prescribed for him by the doctor and the therapist. The main idea is treatment through purposeful exercise. The patients are taught to design and make a variety of articles. They may be engaged in woodwork, plastic design, clay modeling, weaving, leather work, stenciling, running machinery in the print shop, making shell jewelry or tying flies for fishing bait.

Many of the leg cases are helped or cured by exercise on a printing press that is operated by a treadle that has graded resistances. The bending of the knee gradually builds up strength in foot and knee

(*Continued on page* 210)



Shipping operations permit employment of persons having disabilities even to the extent of both an artificial arm and leg.

Processing Food for Sterilization

PART II—Examples of steam and air behavior. "Broken" heating curves and temperature variations caused by air pockets in a retort are explained. Large temperature differences can occur where seemingly they should not

By C. OLIN BALL, Director, Process and Product Research
Owens-Illinois Glass Company, Toledo, Ohio

LET us examine the behavior of a mixture of steam and air under specific assumed conditions.

We shall assume that Fig. 1 represents in vertical cross section a large retort into which steam enters through the opening *C*. The retort *D* is of immense size, indicated by the break in the cross-section drawing at *R.S.* For the purpose of illustrating certain principles, the steam is represented in Fig. 1 as being produced by evaporation of water in the compartment *AB*. This is unimportant from the standpoint of most of our discussion, since steam supplied in this manner to a retort will, in the retort, be identical to steam supplied from a separate boiler.

The odd design of the retort in Fig. 1 is chosen for purpose of adaptation to Case V of the five cases about to be discussed. The unique arrangement of thermometers, pressure gages, and vents is not essential in Cases I to IV inclusive.

Case I

Pressure in Retort after Diffusion of Saturated Water Vapor in Dry Air—Assume that retort *D* is filled with dry air at room temperature and compartment *AB* is filled with water at the same temperature, T_1.

When water is introduced into a closed vessel containing dry air under a given pressure, evaporation of the water takes place until the vapor tension of the water vapor in the vessel (after diffusing with the air) is equal to the vapor pressure of the water at the temperature under which it stands. The resultant pressure within the vessel is the pressure exerted by the given quantity of air when occupying the given volume V_1 at temperature T_1, plus the vapor pressure of water at T_1.

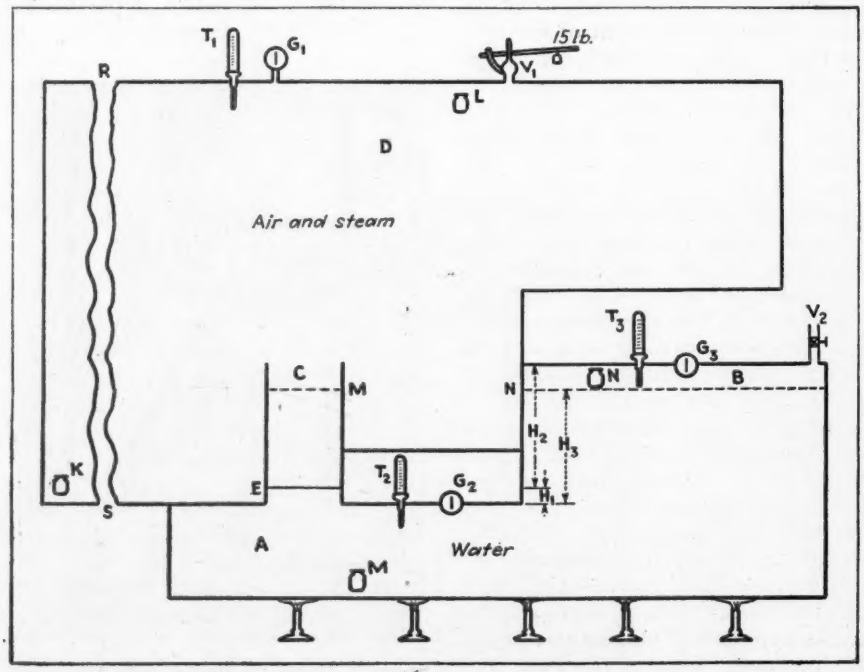


Fig. 1. This odd—even grotesque—design of an immense retort has been chosen to illustrate the principles involved when heating containers by steam-and-air mixtures.

The foregoing resultant pressure could be attained only if there were at least enough liquid water to supply the vapor to fill volume V_1 at temperature T_1 and exert a vapor pressure equal to the vapor pressure of water at the same temperature. Thus, if the large chamber (including enclosures *D* and *AB* in Fig. 1) is filled with dry air at an absolute pressure of 1000 mm. of mercury at 86 deg. F. and one drop of water is introduced into the room, the water will ultimately evaporate. The vapor so formed will diffuse uniformly throughout the room in due time, and the pressure in the room will increase only by an amount equal to the pressure exerted by water vapor at 86 deg. F. at the slight density of 1 drop diffused in the large room.

Since the vapor pressure of water at 86 deg. F. is 31.86 mm. of mercury, if it is desired to increase the pressure in the room by 31.86 mm., it is necessary to evaporate enough water to fill the room with water vapor of a density of 0.00003037 at 86 deg. F. In a state of equilibrium the room must be filled with saturated water vapor plus the air, the vapor exerting a pressure equal to the vapor pressure of liquid water at 86 deg. F. If we assume that all vent valves remain closed and that no air escapes, the internal pressure of the room will be 1031.86 mm. of mercury.

In Case I, the steam is in a saturated state when it enters the retort. We shall now consider a case in which steam enters in a superheated or unsaturated state.

Case II

Change from Unsaturated to Saturated Water Vapor Within a

Retort During Venting — When water contains salts in solution, its vapor pressure at a given temperature is less than that of pure water, the amount of the difference depending on the nature and concentration of the solution. At atmospheric pressure, a saturated solution of sodium chloride boils at 227.1 deg. F. while one of calcium chloride, which contains 76.4 percent of salt, boils at 355.1 deg. F.

Assume that a quantity of a saturated solution of sodium chloride at 86 deg. F. were put into enclosure *AB*, then enclosure *D* filled with dry air at an absolute pressure of 1000 mm. of mercury at 86 deg. F. Pure water vapor will rise from the surface of the solution and diffuse with the air, causing an increase in pressure in enclosure *D*. If heat is supplied to the solution at such a rate as to keep the temperature of the solution at 86 deg. F. while it gives off water vapor into the air, the resultant pressure in enclosure *D* will be approximately 1022 mm. of mercury instead of 1031.86 mm., as was true in Case I.

The salt solution in enclosure *AB* now is heated very slowly so that water vapor pressure, evenly distributed throughout enclosure *D*, is always practically equal to the vapor pressure of the solution, and the temperature of the air and vapor mixture is always practically equal to that of saturated water vapor at the vapor pressure of the solution. When the temperature of the air and vapor mixture becomes 212 deg. F., the pressure of that mixture will be 1991 mm. of mercury (1231 mm. due to the air and 760 mm. due to the steam), and the temperature of the solution will be 227.1 deg. F. By then venting slowly through the vent valve V_1 while the temperature of the solution is held constant, we will have expelled all air from enclosure *D*, leaving only steam at 212 deg. F. by the time the absolute pressure becomes 760 mm. As soon as the air is expelled, the solution begins to boil. The vapor, as it leaves the solution, has a pressure of 760 mm. but its temperature is above 212 deg. F.; it is, therefore, unsaturated and at once begins to cool. When it reaches 212 deg. F. it becomes saturated, and any further loss of heat causes condensation.

Case III

Conditions in a Retort during the Formation of "Pockets"—We may consider that enclosure *AB* is filled with a saturated solution of calcium chloride and retort *D* is filled with air at atmopheric pressure. The initial temperature of either the solution or the air need not be specified. The vent valve V_1 is set to open at 15 lb. gage pressure, or 1535 mm. of mercury, absolute scale.

The solution is heated, causing the liberation of increasing quantities of water vapor or steam from the surface *E*. The solution is brought to boiling in five minutes or less.

With venting at only one point placed so as to induce a direct flow of steam from the point of entrance without passing through certain regions within the retort, the conditions will permit the presence of "air pockets" unless strong forced circulation is provided. There is no such circulation.

As steam enters retort *D* from surface *E* of the boiling solution, and the escape of air and steam takes place through vent valve V_1, an "air pocket" may be presumed to persist in the location *K*. On the other hand, within a reasonable length of time after the solution starts to boil and a good rate of steam supply is established, a region of pure steam may be presumed to exist at a point directly above the opening *C*.

By "pure" steam is meant steam containing only an infinitesimal amount of air. It is realized that, except by chance, absolutely air-free steam is never obtained even in a perfectly bled retort.

The pressure in retort *D*, as registered by the gage G_1, is 15 lb. Since, in the region of pure steam, this pressure is maintained by saturated steam alone, the vapor tension of this steam is 15 lb. and the temperature is 249.7 deg. F.

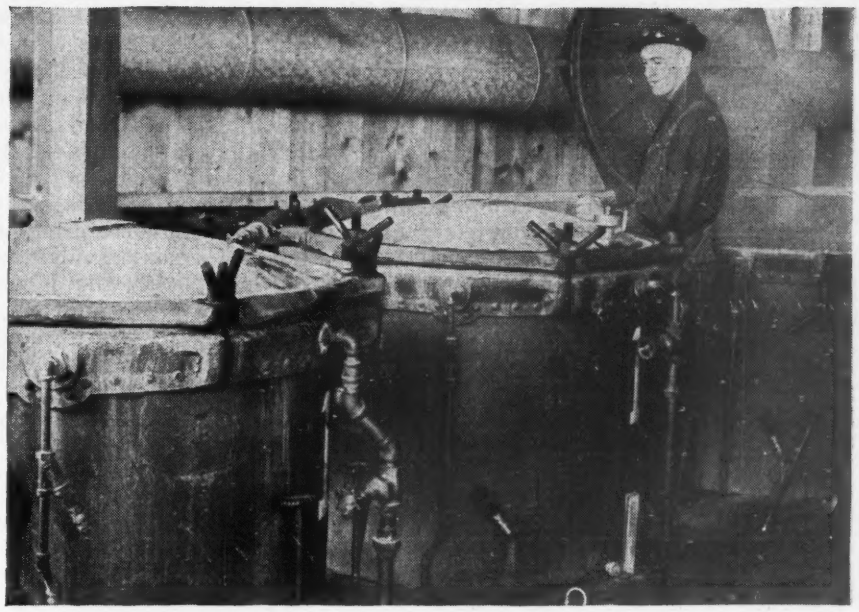


Fig. 2. Operator tightening the bolts on a conventional vertical "still" retort equipped with special compressed air lines needed when sterilizing glass containers.

Continuous Gradation

There is a continuous gradation in density of the air in the retort, going from its maximum density within the region *K* down to its minimum density in the region of pure steam. The entire volume of the retort may be imagined to be divided into very small elements, within each of which, owing to the infinitesimal size of the element, the air may be considered to be at uniform density. The temperature and the density of the air in each element determines the outward pressure exerted by that air.

Since the pressure within the retort is maintained constant at 15 lb. by a pressure controller, the outward pressure of every volume-element must be 15 lb. per square inch, except as very small variations may be brought about by such factors as condensation of steam, bleeding, etc., which produce circulation of the vapors within the retort.

We may assume that we choose an instant at which none of these factors is operative so that the pressure in every volume-element is exactly 15 lb. It is evident that the part of the pressure in each element which is not supplied by air must be supplied by another vapor. The only other vapor present to do this is steam. Therefore, enough steam will enter each volume ele-

ment to make up the deficiency in pressure supplied by the air. So, in the volume-element or -elements of greatest air density, if it should happen that the density of the air is sufficient to maintain 15 lb. gage pressure at the temperature at which it stands, there would be no steam in this or those volume elements. This condition could not be maintained indefinitely, however, because, as soon as steam has made its way to the walls of such a volume element, the steam must begin to diffuse with the air within the element. When this happens, unless there is a reduction in temperature of the air, air must be displaced from the volume-element by the steam. This must occur because, if all the air which was in the volume-element remained there after steam had entered the element without a drop in temperature, the pressure within the element would rise above 15 lb. There could be a drop in temperature of the air in the element, due to absorption of energy by the steam to effect expansion of the steam as it enters the element. If the drop in temperature were sufficient, air would not be expelled from the element in order to keep the pressure at 15 lb.

Since the boiling temperature of the solution in enclosure *AB*, under 15 lb. gage pressure, will be above 392 deg. F., the walls of each bubble of steam are at a temperature above 392 deg. F. Steam in bubbles within the solution is probably superheated, even though the pressure within the bubbles is slightly greater than 15 lb. This probably is true even though the steam, in its expansion, has absorbed more heat energy than it could possibly give off in cooling from the temperature of the solution to the saturation temperature corresponding to its pressure. Upon leaving the surface of the solution, the steam immediately has a pressure of only 15 lb. and it is still unsaturated, just as it might be for an instant if it were issuing from a steam supply line. It gives up heat energy as rapidly as surrounding conditions permit, however, and thus soon either condenses or becomes saturated steam at 15 lb. pressure at a temperature of 249.7 deg. F.

Localized Increase

Any localized increase in temperature above 249.7 deg. F. without an increase in pressure, or any decrease in pressure below 15 lb. without a decrease in temperature of this steam after it leaves the surface *E* of the solution, or after it leaves the first region of pure steam at 15 lb., would change it to unsaturated steam.

If a localized increase in temperature should occur, and were maintained, the steam in the region would have to remain unsaturated (even though the tendency of vapor is always to approach a saturated state) unless additional steam entered the region thus expelling some of the air, because the pressure in the retort is maintained at 15 lb. Any portion of steam that moves into a volume-element that contains air may become temporarily unsaturated because it can no longer exert 15 lb. pressure. It must now share the pressure within the volume-element with the air. It probably will quickly either condense or assume the saturated state, however, because of its high absorption of energy in expanding. Some steam will condense in order to supply energy to expand that which does not condense.

Consider a particular volume-element in location *K*, containing air of density sufficient to give a gage pressure of 10 lb. Sufficient steam has entered this volume-element to bring the total pressure within the element up to 15 lb., i.e., the steam is sufficient to exert in itself a pressure of 5 lb. As this steam pressure is much lower than the saturation pressure corresponding to 249.7 deg. F. (the temperature of the steam prior to its entering this volume-element) the steam temporarily may become unsaturated. It will, however, quickly drop to the saturation temperature, 227.2 deg. F., corresponding to 5 lb. gage pressure, and simultaneously will absorb energy from its surroundings (probably latent heat from other steam which condenses) in order to accomplish its expansion. If it happens in this exchange of heat that the temperature of the steam be reduced to 227.2 deg. F. just at the time the temperature of the air reaches 227 deg. the steam will become saturated at this temperature. If the steam drops to 227 deg. F. before the air is raised to this temperature, there will be a further lowering of temperature of the steam and consequently some condensation until the steam and air attain equal temperature. If the air reaches the temperature of 227 deg. while the steam is at a higher temperature, there will be a further elevation of the temperature of the air, and the steam in this volume-element will remain unsaturated.

Should the pressure of this volume-element, after the steam became saturated, suddenly become less than 15 lb., the steam in the element would again become temporarily unsaturated but immediately would become saturated at its reduced pressure as heat is absorbed in expansion of the steam and air. A part of the steam would condense to provide energy for ex-

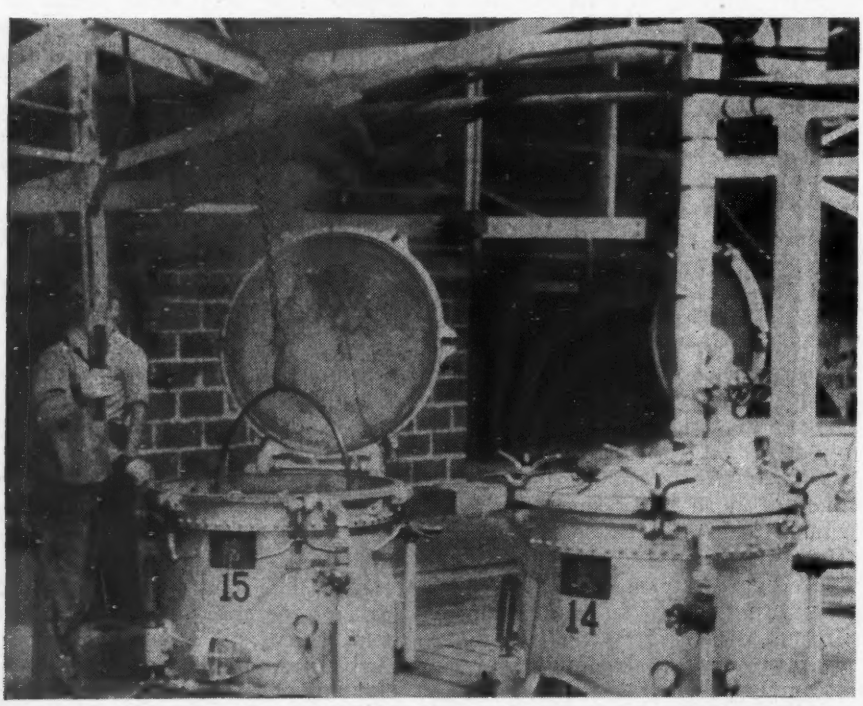


Fig. 3. Vertical "still" retort, equipped with automatic control instruments. Though controllers will control, only venting will get rid of the air-steam mixture problem.

pansion of air and steam by giving up latent heat.

In every volume-element containing air, the steam will be in a state analogous to one of those just described. At each point the partial pressure of the steam alone will be just the deficiency of the pressure of the air in the volume element below 15 lb. Just as there is a continuous gradation in air pressure from almost nil in the region of "pure" steam to almost 15 lb. in the region of "pure" air, there is also a gradation in steam pressure from almost nil in the region of "pure" air to almost 15 lb. in the region of "pure" steam.

Case IV

Heating of Solid Objects Within Mixture of Steam and Air—We now place into the retort described under Case III solid objects, such as containers of food, at comparatively low temperature. One container may be at *K*, another at *L*.

As the solution *A* is heated and steam from surface *E* mixes with air in the retort, each container will be heated by latent heat from steam condensed on its surface until the container assumes the saturation temperature of the steam in the mixture of air and steam surrounding the container. Above that temperature, since the steam can no longer become saturated and therefore cannot condense, heating of the container can take place only through transfer of kinetic, or sensible, heat from the air and superheated steam to the surface of the container.

The heat energy that is imparted to the container during the latter stage of heating is in part conducted through the air and steam surrounding the container, and in part carried to the container by convection currents.

It is assumed, however, that convection currents around the container during this stage of heating do not change the proportions of air and steam in the mixture in contact with the container. Latent heat, therefore, cannot be imparted directly to the container, although the air and steam that transmits the sensible heat derives this energy as latent heat from condensation of steam at points some distance from the container where the saturation temperature is higher than the temperature of the medium surrounding the container.

We may assume that 5 minutes after solution *A* begins to boil, the medium surrounding container *L* is 6⅔ percent air and that surrounding container *K* is 80 percent air. Since the processing pressure is 15 lb. gage, the saturation temperature for steam at *L* is that corresponding to 14 lb. pressure, and at *K*, that corresponding to 3 lb. pressure, or 247.8 deg. F. and 221.5 deg. F. respectively.

Keeping in mind the principle here illustrated, we find it not difficult to explain why heating by a mixture of air and steam is slow. The reasons are:

1. The effective processing temperature for the container at which heat energy can be transmitted to the container at a rate worthy of comparison to that obtained in a pure steam process is only the saturation temperature of the steam at its pressure in the mixture. For example, if the mixture is 50-50 air and steam, and the processing pressure is 15 lb. the maximum temperature at which steam will condense on the surface of a container surrounded by the mixture will be about 234 deg. F. instead of the nominal processing temperature 250 deg. F.

2. Unless there is forced circulation to move the air away from the container, the temperature below which condensation of steam will occur on the container will be continuously lowered until the container reaches the saturation temperature of steam in the mixture. Convection currents set up to fill voids adjacent to the container, produced by the condensation of steam, are formed by both air and steam so that the blanket of air around the container increases in density as the steam continues to condense on the container. Thus, assuming that in the beginning, the mixture is 50-50 air and steam, unless the air is forced to move away from the container by major convection influences or by other means, the content of air in a given portion of the mixture in contact with the container will become 75 percent of the total as soon as the condensation of all steam originally included in the given portion of mixture is completed. The effective processing temperature then would be only about 224 deg. F.

3. Even when the container is receiving heat energy from steam being condensed on its surface, the rate of this transfer is retarded as compared to the rate of transfer in pure steam at the same temperature because the air interferes with the movement of steam molecules to the surface of the container.

4. After the container shall have reached the saturation temperature of the steam in the mixture surrounding the container, the transfer of heat energy to the container will be as from a non-condensible gas and will be dependent upon: (a) the rate at which the air and steam mixture can be heated by steam entering the retort; and (b) the velocity of convection currents past the container. At best, heating by transfer of kinetic energy from a gas is slow compared to that of the transfer of latent heat from condensing steam or that of the transfer of kinetic heat from water.

Latent Heat Factor

It is clear, in a consideration of the preceding explanation of the behavior of a mixture of steam and air, that the rate of heating of a solid object in such a mixture is not indicated by the temperature of the mixture as measured by a thermocouple or other temperature measuring instrument. For example, if the temperature of the surface of the object is higher than the saturation temperature of the steam in the mixture, even though the temperature of the steam and air is higher than that of the object, heating of the object is very slow because latent heat does not participate in the heating.

In these phenomena, associated with the imparting of heat to a container of food by a mixture of steam and air, we appear to have an explanation of the broken heating curve. A hypothesis is established that provides a logical explanation of this characteristic of heating, which is typical of products having low or intermediate thermal diffusivity constants. A very small quantity of air in the steam supplied to the retort may be sufficient to build up around a container of food an air blanket of sufficient density to materially reduce the saturation temperature of the steam in contact with the container. This interpretation suggests that we look outside rather than inside the container for an explanation of the broken heating curve. (A thorough experimental investigation of this point is underway.)

Another explanation of broken heating curves, involving an effect external to the container, was suggested but not published, several years ago by F. C. W. Olson. Olson's explanation, as applied to fast heating products, assumed that a break in the heating curve is produced by a decrease in the film

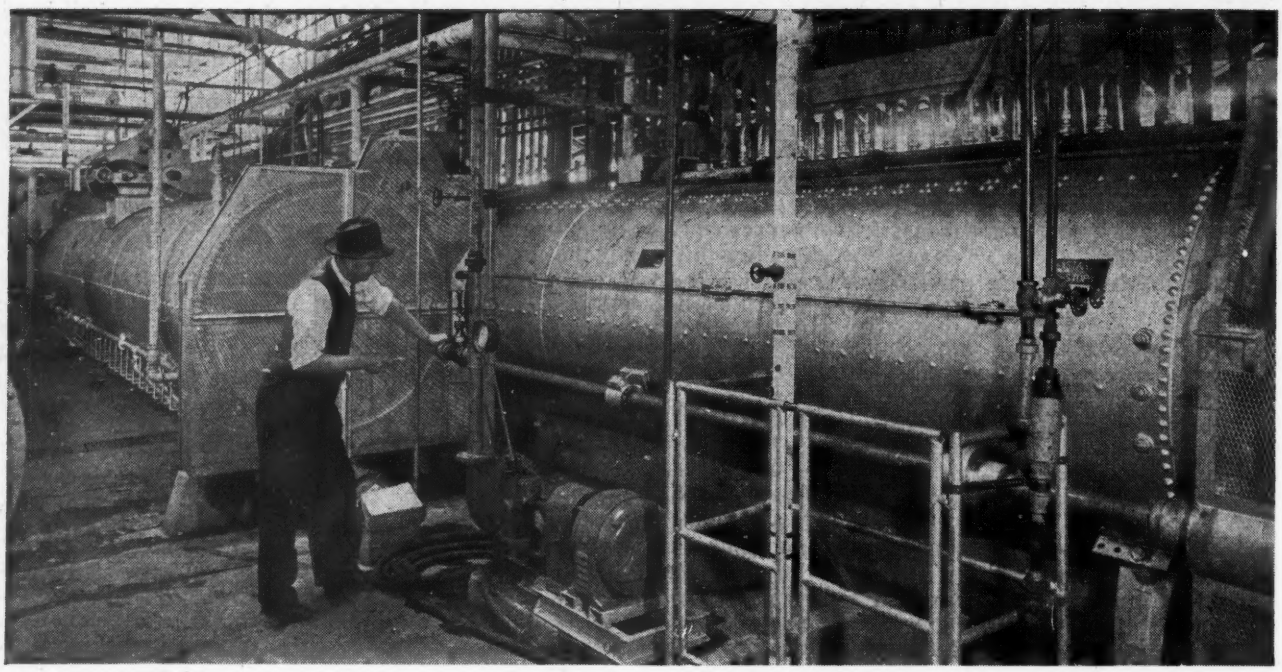


Fig. 4. The Anderson-Barngrover continuous pressure cooker discharges continuously into a pressure cooler. By its agitating movement of the containers, continuous cooking improves rate of heat penetration; and has fewer steam-air mixture problems.

coefficient of heat transfer as the difference in temperature between the container and the retort diminishes. This postulation is unrelated to that set forth above which is based on the behavior of steam and air.

Case V

Boiling of Water and Agreement of Temperature with Pressure in a Retort Containing Air—The following discussion is intended to answer in the affirmative two questions that are sometimes asked regarding the behavior of water, steam, and air in retorts. The questions are:

1. Will water boil in a retort before the air is exhausted?

2. Can there be agreement between a pressure gage and a thermometer with its bulb immersed in water before the air has been exhausted from the retort?

Refer to the retort illustrated in vertical cross section in Fig. 1. Water at a temperature of 86 deg. F. is placed in the lower compartment, *AB*; then dry air (also at temperature of 86 deg. F.) is forced into the retort *D* under 15 lb. gage pressure, or 29.715 lb. absolute pressure, the vent V_3 being left open until the water completely fills the compartment *B*. Valve V_3 is then closed, the water surface in contact with the air in *D* being at *E*. The lever valve, V_1, is set at 15 lb.

Under these conditions, the readings of the three pressure gages will be:

Gage No.	Pressure lb.
G_1	15
G_2	$15 + P_1$
G_3	$15 - P_2$

where P_1 is pressure due to the head of water H_1, lying between the surface level *E* and the level of gage G_2; and P_2 is pressure due to the head of water H_2, lying between the level of gage G_3, and the surface level *E*. The weight of air and vapor is here neglected.

Saturated vapor immediately begins to rise from the surface *E* and to diffuse with the air, adding its pressure to that of the air, and causing the valve V_1 to open slightly and allow sufficient air and water vapor to escape to keep the pressure at exactly 15 lb. Owing to the immensity of the volume of air present, a considerable time will be required for enough vapor to rise from the small surface, *E*, to establish equilibrium between the water and its saturated vapor. We may wait for this equilibrium to be established, however; and then we shall find that, of the 29.715 lb. absolute pressure maintained in the vessel, the air is responsible for only 29.104 lb. while the remaining 0.611 lb. is the pressure exerted by the water vapor which has diffused with the air to form a homogeneous mixture. In venting, the fraction $(0.611 \times 100)/(29.715)$ or 2 percent of the air is removed.

Rapid Temperature Rise

Now, we shall apply heat to the water in the lower compartment in such quantity that the temperature of the water throughout its volume is raised at the rate of 25 deg. per minute. As the temperature of the water rises, its vapor pressure increases rapidly; and with such a rapid rate of increase, a condition far from equilibrium between water and its vapor must exist in retort *D*, because circulation of steam is not rapid enough to maintain equilibrium. As the pressure tends to increase, because of the vapor which rises from the surface *E* and because of rise in temperature of the air, the valve V_1 allows the escape of a sufficient quantity of the mixture of air and water vapor to keep the pressure constant. If necessary, in order to keep the water surface level at approximately the position *E*, the amount of water within enclosure *AB* may be either increased or decreased from without. As soon as the vapor pressure of the water reaches $29.715\text{-}P_2$ lb., water vapor will form above the water in region *B*. If P_2 is small, this will not occur until the temperature of the water almost reaches 249.7 deg. F.

As the temperature of the water approaches very near to 249.7 deg. F., the pressure of the vapor above the water surface at *B* approaches 15 lb. Since this surface is large,

(*Continued on page* 206)

Packaging the Gobbler

Packaging goes hand in hand with eviscerating and freezing developments. Frozen, cut-up toms and cellophane-wrapped whole birds packed in cartons are innovations that may revolutionize raising and processing of turkeys

By CRAWFORD POLLOCK, C. A. Swanson & Sons, Omaha, Neb.

WITH the development and continual improvement in eviscerating and freezing poultry, parallel developments and improvements in packaging followed. In 1946 two major innovations in turkey merchandising took place. One may have far-reaching effects on the turkey growing and processing industry.

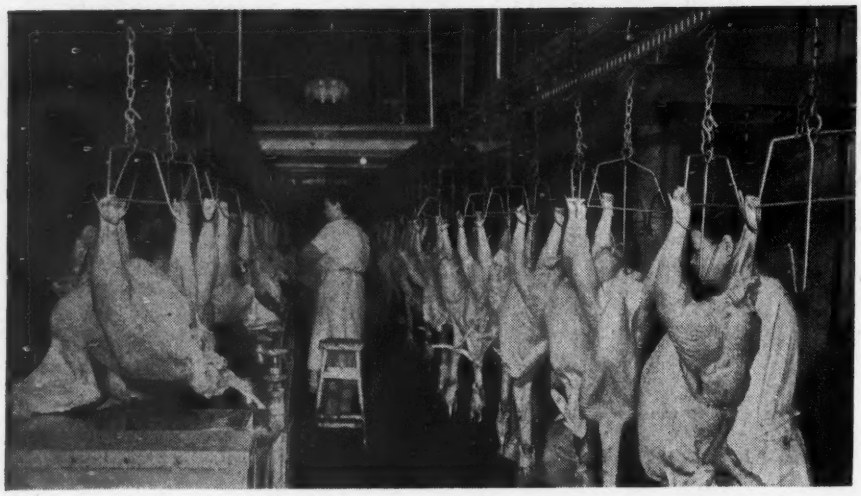
The introduction of cut-up turkey was the most spectacular of the two turkey packaging developments adopted by C. A. Swanson and Sons, Omaha, Nebraska.

Packaging cellophone-wrapped eviscerated whole turkeys in individual cartons was the second major development.

Marketing research indicated that there was a ready market for turkeys in cut-up form. Many supermarkets and chain stores were already cutting up large birds to increase their sales. It was recognized for some time that tom turkeys were beginning to create a sales bottleneck. Each year the cumulative effect of years of breeding began to show its effect in larger and larger size toms. The customer, on the other hand, showed more and more resistance, demanding only the smaller hens. The customer was paying a $0.15 to $0.20 per lb. premium for hen turkeys.

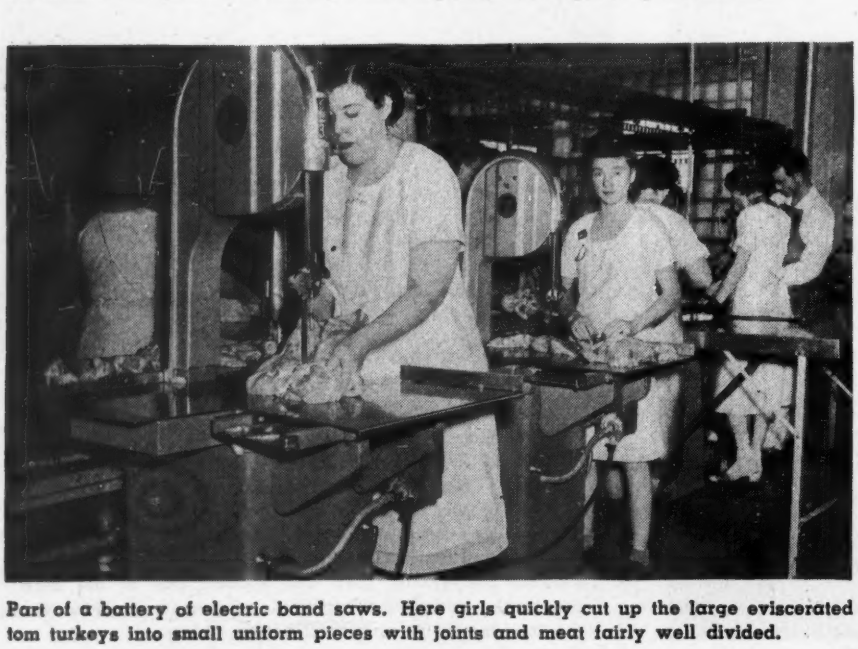
If tom turkeys were cut up and sold to the customer, she would have a more convenient item, cost-

(Upper left): Two different size cartons are used to accommodate hen and tom turkeys weighing up to 20 lb. These lithographed cartons were developed by C. A. Swanson & Sons with the cooperation of Container Corporation of America. Eviscerated whole turkeys are first wrapped in moisture-proof cellophane and then packed in wax board cartons. By scoring the top of the cartons, the retailer can open the carton, display the turkey and still identify the product and brand. (Left and above): One of the most spectacular turkey packaging developments in 1946 was the introduction of packaged cut-up turkey.



Start of one of the Swanson eviscerating lines. Heavy tom turkeys on the right are on their way to the cut-up department. They continue around the line at the left.

Giblets are removed and packaged. Entrails are carried away by a traveling tray belt. Government inspectors at rear-right carefully inspect every turkey on the line.



Part of a battery of electric band saws. Here girls quickly cut up the large eviscerated tom turkeys into small uniform pieces with joints and meat fairly well divided.

ing less per lb. than hen turkeys. Solution of a marketing problem at the same time would bring an economic blessing to the customer.

It was found after a little experimenting that big toms could be cut up at the end of the eviscerating line, with joints and meat fairly well divided. The home economics department developed excellent recipes for cut-up tom turkeys.

It was necessary to put a premium on grading cut-up turkey. The customer was able to focus her attention more on the cut-up product than on the whole bird.

Packaging Cut-up Turkey

The problem of packaging cut-up turkey was difficult from an engineering and materials standpoint. Ultimate solution came out of a packaging round table, which involved three carton manufacturers and a supplier of cellophane. The companies included Container Corp. of America, E. I. du Pont de Nemmours and Co., Inc., Marathon Corp. and Waldorf Paper Products Company. This was a splendid example of cooperation on the part of the suppliers of packaging material, showing the benefit of taking the supplier into your confidence.

Waldorf Paper Products Company finally accepted the assignment and others contributed their suggestions. Results of this combined, constructive effort are illustrated. Early results indicate that packaged, cut-up tom turkeys may eventually rival cut-up frying chickens in volume. This development may be the means of building up turkey into a volume year-round seller.

Packaging Whole Birds

Early in 1946 it was decided to package Swanson Ever-Fresh turkeys in individual cartons. Prior to this, attempts had been made to cellophane-wrap the birds and pack them in open-top corrugated cartons for display purposes. Rather than help the situation, they detracted from the display value.

Use of cellophane alone did not prove satisfactory. The cellophane could not withstand rough handling during shipment and merchandising. The stockinette, which was later added as an overwrap, protected the cellophane against rough handling, but impaired visibility.

Accordingly, a lithographed container was developed in cooperation with the Container Corporation of

America for two sizes of hen and tom turkeys. By scoring the top of the carton, display value was given to the package. In opening up the scored portion of the carton in retail stores for display purposes, product and brand identification were not lost.

In individual cartoning, the birds were first wrapped in moisture-proof cellophane, and then packed in moisture-proof waxed cartons. Cellophane provided primary protection against dehydration. Additional protection was given by the waxed container.

One serious difficulty that arose with the decision to use individual cartons was the possible increase in freezing time due to greater insulating properties of the carton board. Previously, cellophane-wrapped turkeys, protected with stockinette, were first frozen and then packed for shipment.

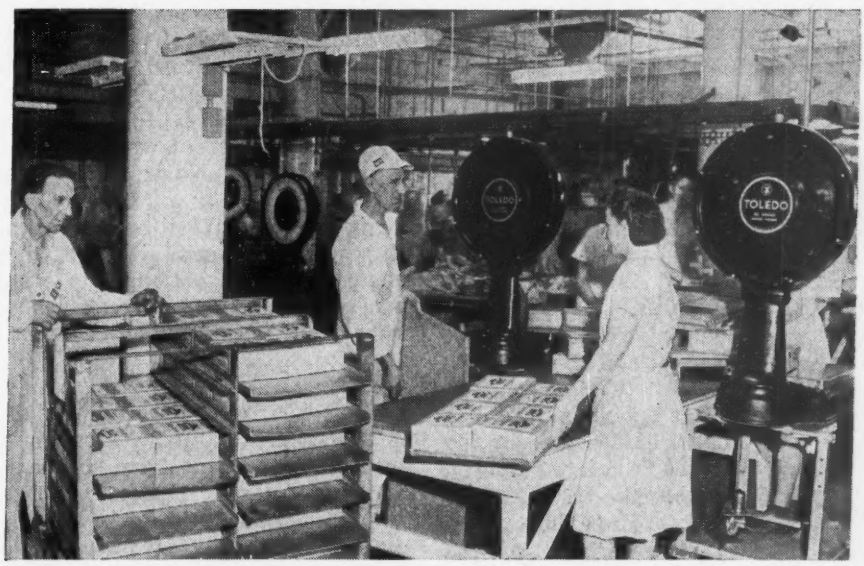
Freezing Turkeys

Solution of the freezing problem was worked out in the construction of a special wire-bound shipping unit by Great Southern Box Company. The arrangement of four cartons of turkeys in this unit, with ends exposed, actually decreased freezing time due to controlled air flow. Formerly, four to eight turkeys, depending on the size of the bird, were packed to a shipping unit. The greatest advantage, however, resulted in the general speed-up of the packing operations, since once the master units were packed, they were ready for shipment after leaving the freezing tunnel. Other advantages in shipment and stacking became apparent, and retailers were benefitted by a lower minimum sale requirement.

A substantial quantity of turkeys are also packed by C. A. Swanson & Sons in 6-oz. and 16-oz. tins for the consumer trade, and 35-oz. tins for the institutional trade. The meat shortage acquainted millions with canned turkey. With canning lessons learned during the war, canned turkey may be expected to compete with canned meats and fish, particularly when volume increases and prices decrease.

A substantial number of turkeys have been smoked in 1946. Two plants have now been equipped for curing turkeys. While smoked turkey is a high priced specialty item because of the tremendous shrinkage and high production cost, the industry is merchandising more smoked turkeys each year.

Cut pieces of turkey move along the line to the point where they are packed in Waldorf cartons. The parts are arranged by girls according to a definite pattern.



Boxes are weighed, loaded and marked on freezer trays. Loaded trucks are then taken to freezer tunnels and frozen in 10 to 12 hours, then packed in shipping cases.

Four cartons, each containing a whole eviscerated turkey, are packed in a special wire-bound shipping unit. These units permit air circulation and decrease freezing time.

Rapid Dissolved Oxygen Test For Fresh Citrus Juices

A rapid, simple and accurate test has been adapted for determining the amount of dissolved oxygen in citrus juices. It is useful in studying deaeration efficiencies, important in the keeping qualities of juices

By J. RAYMOND LINDQUIST
Fruit and Vegetable Chemistry Laboratory,* Los Angeles, Calif.

THE amount of dissolved oxygen remaining in citrus juices during and after processing is an important factor in their keeping qualities, particularly from a standpoint of vitamin C retention and changes in flavor characteristics. Many citrus juice plants are confronted with the problem of determining dissolved oxygen in juices during processing. Several procedures, including the usual gasometric methods[1, 2] and the more recent enzymatic method[3], have been devised for this determination, but they have not been accepted by the industry because of lack of rapidity, accuracy, or simplicity. The apparatus and procedure herein described offer a rapid, accurate and simple method for the routine estimation of dissolved oxygen in citrus juices.

Various investigators[4, 5, 6, 7] have successfully adapted the dropping mercury electrode for the quantitative determination of dissolved oxygen in water, dairy products, biological products and sewage. This method can also be adapted with comparative ease for the determination of dissolved oxygen in citrus juices. While grapefruit juice is discussed throughout this paper, similar results have been obtained with lemon and orange juices, the principal differences being a slight variation in the slope of the calibration curve.

A number of books and articles have been published on polarography and the use of the dropping mercury electrode. Kolthoff and Lingane,[8] Kolthoff and Miller,[9] and Müller,[10, 11, 12, 13, 14] give detailed discussions and directions for the use of the dropping mercury electrode for qualitative and quantitative analyses. The method for determining oxygen in citrus juices consists fundamentally of measuring the resulting current when oxygen is reduced at the polarized dropping mercury electrode at a potential above the decomposition potential of oxygen. The magnitude of the current is proportional to the amount of oxygen present when other conditions are held constant.

Apparatus

The polarizing apparatus consists of a simple, manually controlled unit (Fig. 1), built from standard radio and electrical parts for less than $5. It also has a fairly sensitive galvanometer. The unit is similar to that described by Müller[11]. A Leeds and Northrup mirror type galvanometer, with a sensitivity of 0.25 microampere per scale division, is used. This sensitivity is sufficient for this application when used at nearly maximum sensitivity. A dropping mercury electrode is used as the polarized electrode and a mercury pool as the reference electrode. With proper care,[4, 8, 11] the dropping electrode will give long service and reproducible results. Should changes occur, recalibration is a simple procedure. The electrolysis vessel consists of a 50-ml. Erlenmeyer flask containing 5 ml. of mercury for the reference electrode. In addition, it is necessary to have a source of oxygen-free nitrogen, a source of compressed air, and a constant temperature bath. An ice bath affords a simple method of maintaining 0 deg. C.

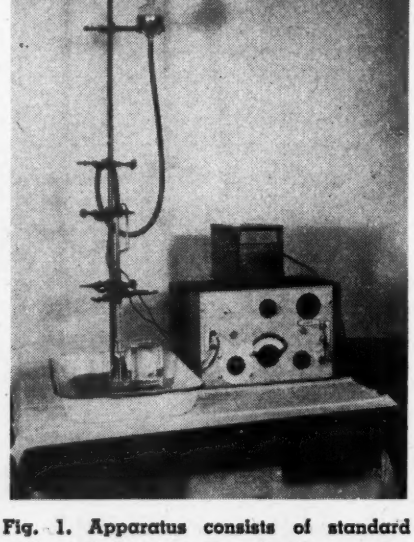


Fig. 1. Apparatus consists of standard radio and electric parts and galvanometer.

Experimental Work

To obtain correct values for dissolved oxygen in citrus juices, it is necessary that no exchange of oxygen take place between the juice and the surrounding atmosphere. The method of sampling depends on the source of the sample. For calibration curves in which the juice has had the oxygen displaced by bubbling nitrogen through it, or has been saturated by bubbling air through it, the sample can be handled under a corresponding atmosphere of nitrogen or air.

In drawing a sample for test purposes from a deaerator which is maintained under a vacuum, the sample bottle (a 50-ml. Erlenmeyer flask containing 5 ml. of mercury for the reference electrode) can be attached to a stopcock, an equival-

* One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

ent vacuum drawn, the stopcock opened, and the juice allowed to flow into the bottle by gravity.

When the bottle is completely filled, the procedure is reversed and the bottle containing the sample is immediately stoppered so as to displace all gas and a small amount of juice from the neck of the bottle. The sample is then brought to a constant temperature. A convenient method of doing this is to place the 50-ml. Erlenmeyer flask in a 250-ml. beaker and surround it with crushed ice.

After about fifteen minutes, the temperature will reach 0 deg. C. and the sample is ready for analysis. Any other constant temperature would be equally satisfactory but 0 deg. C. was chosen as a temperature easy to attain with a minimum of equipment and trouble.

On reaching equilibrium, the flask and beaker of ice are placed in position under the stationary electrode assembly consisting of a platinum contact for the mercury pool and the dropping mercury electrode (Figs. 1 and 2). Polarograms are made by plotting voltage, taken at —0.1-volt intervals, against the corresponding galvanometer deflection. During the few minutes the sample is in place under the electrodes, special precautions to exclude air from the top surface of the sample are unnecessary because the diffusion rate of atmospheric oxygen to the electrode is so slow that it can be disregarded.[4]

The normal pH range of citrus fruit juices (2.8 to 3.5) is satisfactory for the determination and no adjustments need be made, although it is necessary to construct individual calibration curves for each fruit juice. The natural acid in the juice serves as the indifferent supporting electrolyte.

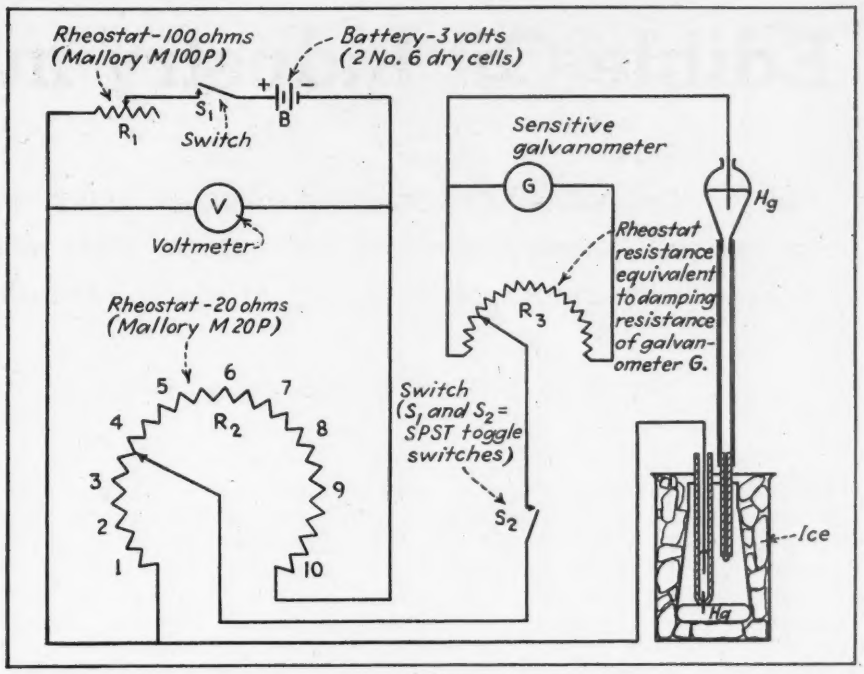


Fig. 2. Diagram of polarizing apparatus used to determine the amount of dissolved air for oxygen in fresh citrus juices. Equipment, excluding galvanometer, costs about $5.

Obtaining Readings

To determine the galvanometer deflection at various known oxygen concentrations, a sample of grapefruit juice was saturated with air at 0 deg. C. A second sample was saturated with oxygen-free nitrogen at 0 deg. C. to displace the air in the juice. These samples were mixed in definite proportions, without incorporation of air, by displacement of appropriate quantities of juice with mercury from completely filled containers into nitrogen-filled electrolysis vessels. Finally the polarograms shown in Fig. 3 were obtained.

The 100 percent air-saturated sample, corresponding to maximum galvanometer deflection, was run first and the circuit Fig. 2 adjusted as follows: Switch S1 turned on. R1 adjusted until voltmeter V indicated 2 volts, R2 set at 6 (equivalent to —1.2 volts). Galvanometer (G) adjusted to zero, then switch S2 turned on and R3 adjusted until galvanometer deflection was nearly full scale. The voltage V and resistance R3 must remain as set for this and all subsequent determinations based on this sample. R2 was turned to zero and curves plotted as in Fig. 3 by advancing R2 the equivalent of —0.1 volt at a time and plotting against the corresponding galvanometer deflection for the 100 percent, 75 percent, 50 percent, 25 percent, and 0 percent air-saturated samples.

From these curves it is obvious that the percent air saturation vs. galvanometer deflection is a linear function between —0.6 and —0.1 volt. On a number of subsequent samples, the residual current with air displaced and the maximum current at 100 percent air saturation were found to check for the same electrode. For routine samples, a single reading at —0.8 volt after the galvanometer had reached equilibrium was selected as the best point

(*Continued on page* 212)

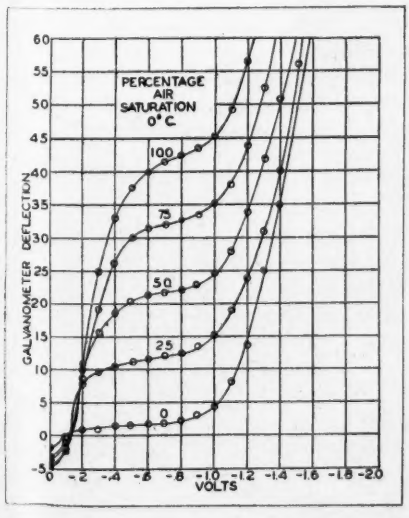


Fig. 3. Polarograms made from samples of grapefruit juice by plotting voltage, taken at —0.1-volt intervals against corresponding galvanometer deflection.

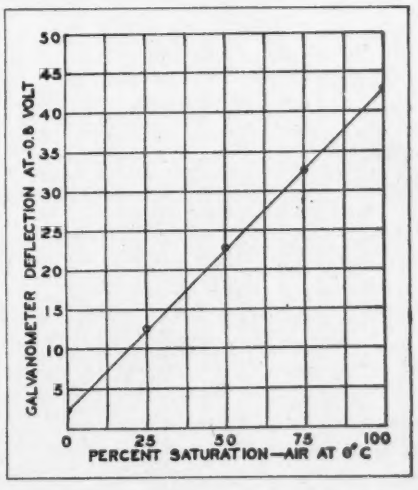


Fig. 4. A reading at —0.8 volt after the galvanometer reached equilibrium was selected as best to secure a galvanometer deflection vs. percent air saturation curve.

Edible Oil Industry in Germany

PART I—German oilseed industry differs in many ways from ours. Economic factors and culinary practices are unlike. Most mills must use many types of machinery to process a variety of seeds, depending upon types imported

By W. H. GOSS, Northern Regional Research Laboratory*, Peoria, Ill.

GERMANY has never produced more than a fraction of its needs for oilseeds. It has depended almost entirely upon imports to supply it edible fats. Furthermore, oilseeds were an ideal commodity for German industries to import, process, and then export as finished articles of commerce in the markets of the world. It is not surprising, therefore, that the processing of oilseeds, fats, and oils became one of the country's major industries, and that much of the oilseed technology practiced throughout the world is of German origin.

Location of Industry

The oilseed industry extends into all sections of Germany, but the greatest concentration is on the Elbe River in the Hamburg-Harburg area where shipping facilities are excellent. Many huge mills were built there for processing soybeans, copra, palm-kernel, cottonseed, sunflower seed, linseed, and practically every other oilseed known in commerce. As a result, the oilseed processing industry in this region became the world's greatest. Other mills are located, for the most part, in seaports or upon navigable rivers, where transportation of raw materials by water is important.

The German fat and oil industry is different from that in this country, because the needs and the resources of the two countries are not the same. Vegetable shortenings, for example, are manufactured on only a very small scale in Germany, in contrast to the huge American market that has been developed for such products.

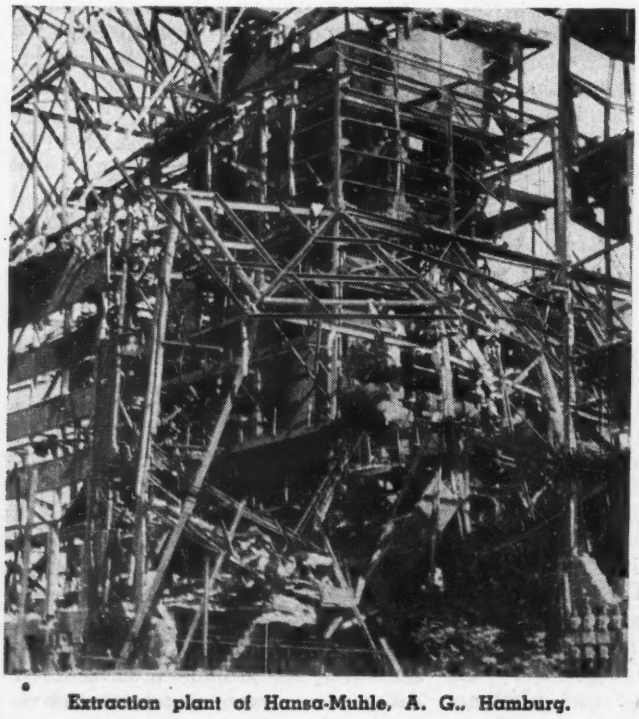
Fat Consumption in Germany

The Main River divides Germany's fat consumers, geographically, into two distinct regions. In the South, fats and oils in the diet are supplied chiefly by the use of soft oils in cooking. In the more populous Northern districts the principal oil-containing commodity is margarine. Indeed, the ultimate production of margarine has become the main objective of processing conducted in almost all of the larger oilseed mills.

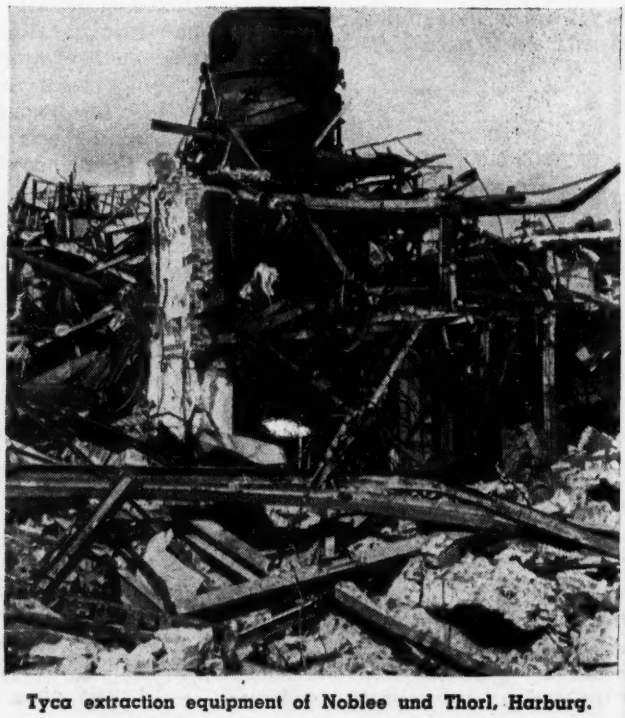
German margarine should not be confused with the product sold under the same name in the United States, for it is made and used quite differently. It is the German housewife's all-purpose fat, employed for frying and baking, as a spread on bread, and for many other uses. It would probably meet poor acceptance by the average American consumer.

Fats were relatively expensive in

* One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.



Extraction plant of Hansa-Muhle, A. G., Hamburg.



Tyca extraction equipment of Noblee und Thorl, Harburg.

Germany, even in normal times, when priced in comparison with the income of an average worker. For this reason, the amount of fats and oils consumed per capita in Germany has been consistently lower than in the United States. Because of the scarcity and relatively high price of fats it is common practice in Germany to dilute them with air, water, and other cheap and inert ingredients to a much greater extent than in this country.

Shortages

The shortage of fats and oils contributed greatly to Germany's defeat in 1918. The Reich entered World War II only after supposedly ample precautions had been taken to prevent a repetition of the earlier breakdown in supplies of edible fats. Methods employed to meet the shortages which inevitably developed after external sources had been cut off are worthy of study from economic and technological standpoints. The former is beyond the scope of this article dealing primarily with the technology observed during an investigation of the German fat and oil industry immediately following victory in Europe.

W. H. Goss, the author, representing the Subcommittee on Food and Agriculture of the Technical Industrial Intelligence Committee, conducted an investigation of the German oilseed industry shortly after the European victory. Following his inspection trip, the author wrote 30 separate reports on the German oilseed industry. These reports were issued by the Office of the Publication Board. The total cost of these reports was $60. The Hobart Publishing Company, Washington, D. C., has made arrangements to reprint this entire series of reports in a two volume publication totaling about 300 pages. The announced price for this compilation is $15, including all illustrations, drawings, and text appearing in the original OPB reports.—The Editors.

Most observers have wondered where Germany obtained sufficient supplies of edible fats, and how the civilian population was able to endure the scarcity of these materials for so long. Briefly, the answer is that German civilians "did without" and suffered hardships which became unbearable toward the end of the war. The weekly ration was only 270 grams of fat per person when the conflict started, and it declined to 200 grams toward the end of hostilities. At the time of this investigation it had fallen to 100 grams per week in many areas. This low level, together with scarcities in other foods, is not adequate to prevent mass starvation.

Refinery of Harburger Oelwerke Brinckmann und Mergell, Harburg.

Wartime Supplies

When the war started, Germany possessed large stores of fats and oils, amounting to more than 600,000 metric tons. Within a short time, the country won control over most of continental Europe and was therefore able to import additional supplies. Several tankers laden with whale oil were captured by the Germans on the high seas, and the hoard was thereby enriched by about 100,000 tons. During the earlier phases of the conflict, soybeans were obtained from Manchuria through Russia, via the Trans-Siberian Railway. Reports circulated in this country that Russia failed to fulfill her commitments and delayed shipments appear incorrect, for records show—and German executives in the oilseed industry confirm the fact—that Russia filled every order completely and on schedule. Altogether, approximately 200,000 metric tons of soybeans were received in this manner, and Russia also furnished 20,000 tons of peanuts and copra.

Oils used in largest quantities before and during the first years of the war included whale, soybean, coconut, and palm-kernel, but in due time the stocks of these were exhausted. In the meantime, however, domestic production of rapeseed had been developed through the payment of subsidies, the funds for which were obtained by taxes imposed on the sale of margarine. Approximately 250,000 tons per year of this crop was grown, chiefly in Eastern Germany on land ordinarily used for the production of wheat; and it was planned to offset the resulting decline in the size of the wheat harvests by obtaining grain from the Ukraine. The failure of this part of the plan contributed greatly to the shortages of fats, oils, and other foods and, consequently, to the ultimate collapse of the country.

Oilseed Industry Organization

Under the Nazi regime, the oilseed industry was rigidly controlled by the *Reichstelle für Fette und Eier* which was a part of the *Reichsbeautragter für Fette and Eier.* These agencies were unpopular with the industry, and to combat their oppression numerous *Fachgruppes* were formed. Thus, the interests of the various companies when dealing with the state are represented by the *Fachgruppe Olmühlenwerke,* the *Fachgruppe Margarine Industrie,* or the *Fachgruppe Seifenindustrie.* Every firm in the fat and oil industry is a member of its respective *Fachgruppe,* and these organizations are still functioning. They are similar to our American trade associations, such as the National Cottonseed Products Association, the National Soybean Processors Association, and the National Associa-

tion of Margarine Manufacturers.

A few large companies own or control a large part of the German oil and fat industry. The largest of these was formed in the late 1920's by a series of mergers involving the Jurgens (Dutch), Van den Bergh (Dutch), Lever (British), Hovema, Schict (Czechoslovakian), and Paensson interests, which eventually adopted the present name of Lever Brothers and Unilever, Ltd. This combine owns wholly or in part a large proportion of the German facilities for processing oilseeds, refining oils, and manufacturing margarine. In the field of soaps *Henkel und Cie* and *Unilever* are the most important operators, the former reportedly manufacturing about 75 percent of all the detergents made in Germany.

Processing Oilseeds

Most German oilseed mills must handle a variety of raw materials, and, therefore, employ methods quite different from those practiced in American mills. A few German processors specialize in one particular oilseed, but they must be prepared in times of scarcity to accept any other seeds that can be obtained.

In general, soybeans are processed by solvent extraction, and almost all other seeds are forepressed in expellers and subsequently extracted with solvents. In rare instances soybeans have been forepressed in expellers and finished in plate-type (Anglo-American) or cage presses. Other oilseeds are frequently finished in cage presses, and occasionally in plate presses, particularly copra and palm-kernels. Indeed, these two types of presses are sometimes used for forepressing.

Thus, an almost endless variety of processing methods is encountered in the country, but the larger and more modern mills follow the usual practice of forepressing seeds of high oil content in expellers and then treating the residue in either batch or continuous extractors. German expellers, unlike their American counterparts, are primarily high-capacity, low-pressure machines whose chief function is to reduce the oil content of high-oil seeds to a point where solvent extraction is feasible. Forepressing at low pressures is generally employed because such a procedure is the cheapest way known for removing the largest part of the oil contained in such seeds as palm-kernels, peanuts, and rapeseed. The unit-power consumption is relatively low, there is little wear on the machinery, and it is unnecessary to evaporate several volumes of solvent for every part of oil recovered as where solvent extraction is used. There are, of course, other advantages and disadvantages, some of the former of which merit greater attention in this country.

Within the past five years, the mills in Germany have processed little of any oilseed except colza, or rapeseed. The usual procedure is to press it one to three times in expellers and then to extract the cake. The use of two forepressings is typical, reducing the oil content from about 41 to 25 and from 25 to 13 percent, respectively. Approximately the same treatment is accorded peanuts.

Extractors

The Germans use both multiple-contact batch and continuous extractors. There are wide differences of opinion as to which type of system is the better economically. The batch installations are arranged in batteries of approximately 10 kettles, each with a charging manhole at the top, a discharging door on the side near the bottom, and a wedge-wire or equivalent screen for a false bottom. A vertical stirring shaft projects through the top and bears horizontal sweeping and stirring arms for moving the charge while the solvent is being evaporated. The material to be extracted is charged into the kettles, and solvent is pumped through about five in series, using a sequence of operations that provides counter-current contact between the solids and the solvent. Every few minutes a fresh extractor is added to the line and a spent one taken off for removal of the solvent. This is accomplished by blowing live steam through the meal while the stirrer is operating.

Solvent Recovery

The equipment used for recovering solvent from the miscella is about the same in both the batch

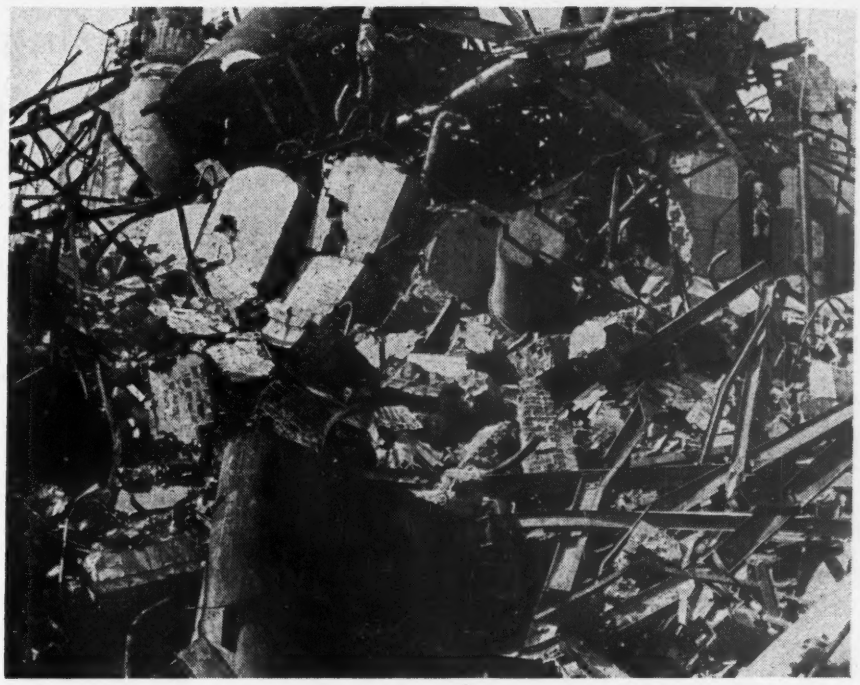
Vegetable oil mills and refineries of Noblee und Thorl, Harburg, once one of the largest oilseed and oil processing plants in the world.

and the continuous systems and resembles that used in the United States. The miscellas obtained from the individual extractors are combined, filtered, and then concentrated in evaporators which remove approximately 95 percent of the solvent. There are many types of these, including those with horizontal steam tubes, vertical or inclined tubes with boiling miscella rising inside and steam condensing outside, and vertical tubes arranged for pre-evaporation from falling films on the inner tube surfaces. Finally, last traces of solvent are removed from the oil by stripping with direct steam which is usually superheated sufficiently to prevent condensation of moisture in the finished crude oil. These final evaporators are nearly all of the falling-film type, employing either vertical tubes or inclined baffles, but in some cases packed towers or bubble-cap columns are employed. All operations used for the recovery of solvent are conducted at atmospheric pressure.

German Equipment

The two commonest types of continuous extractors used throughout Europe are also well known in the United States, for they were originally exported to this and other countries from Germany. They are the Bollmann, or Hansa-Mühle, and the Hildebrandt systems. The former consists of a paternoster or chain of baskets which are automatically filled with flaked seed or press-cakes, sprayed with solvent countercurrently while traversing a closed circuit similar to that of a bucket elevator, and finally emptied by being inverted over a discharging hopper. The Hildebrandt equipment consists of a vertical U-tube through which the solids are propelled countercurrently to the solvent by perforated screw conveyors. Several other types of continuous extraction equipment were in use, including those of Fauth, Miag, and Tyca. As far as could be ascertained, there were no commercial installations of the Böhm extractor in Germany.

Although in batch extraction the solvent is removed from the marc by blowing steam through the charge while it is still in the extractor, in continuous processes the solvent is allowed to drain as thoroughly as practical; and the meal then passes through a series of steam-jacketed screw conveyors. The injection of direct steam in the final stages of this operation facilitates the removal of all of the solvent material.



This was a refinery for coconut and palm kernel oils.

Recovery of Lecithin

The recovery of phosphatides from crude oil is an important operation in most German oil mills. The process consists in washing the crude oil with two to five percent of hot water and removing the resulting sludge in a centrifuge. The practice was established on a large scale during development of the soybean processing industry, presumably as a means for preventing the formation of sludge in the crude oil during storage and shipping. Later, the removal of lecithin became one of the vital steps in a commonly employed method for combatting reversion, or "Umschlag," and most mills accordingly subjected the oil to two successive washings and centrifugal clarifications. In some cases, even a third washing with a solution of aluminum sulfate, sodium sulfate, and sulfuric acid is utilized to effect an exceedingly thorough removal of the phospholipids.

Crude lecithin is ordinarily dried under vacuum at a temperature of approximately 60 deg. C. and then bleached with hydrogen peroxide. Its chief use is as an anti-spattering agent in margarine, where it ordinarily comprises about 0.5 percent of the finished material. This and additional outlets for lecithin eventually grew so large that mills found it desirable to recover the phosphatidic materials from other oils. The yields attained commercially were said to be approximately as follows, based on the weight of seed:

Soybeans	0.50 percent
Rapeseed	0.35 percent
Linseed	0.25 percent
Peanuts	0.20 percent
Sunflower (with hulls)	0.15 percent
Palm-kernel	0.10 percent

Ordinary lecithin obtained by drying and bleaching the water-precipitated sludge contains 30 to 40 percent of crude oil, which is objectionable in some applications. Its removal, therefore, is practiced on a commercial scale by extracting the dried sludge repeatedly with acetone, and subsequently replacing the crude oil thus removed with an equivalent amount of cocoa butter or some other refined oil.

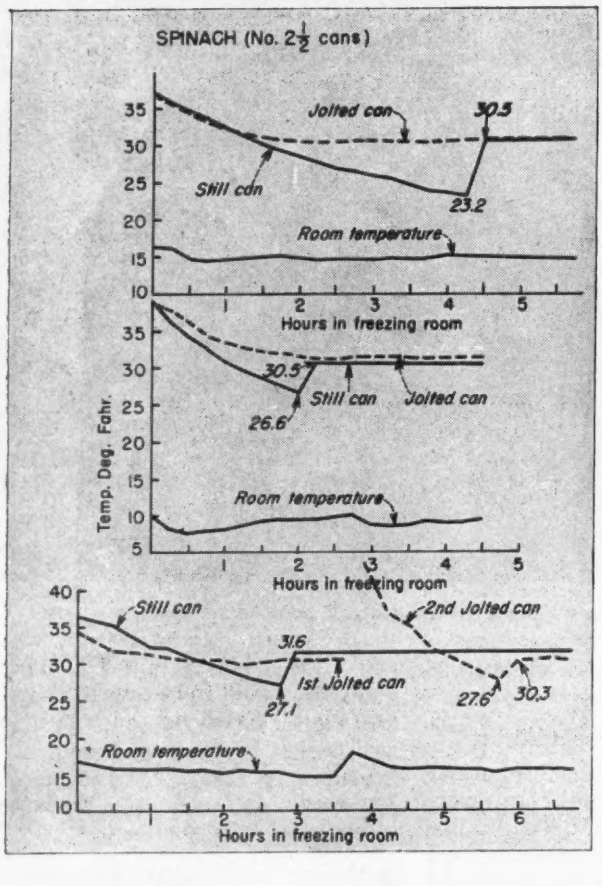
Acknowledgment

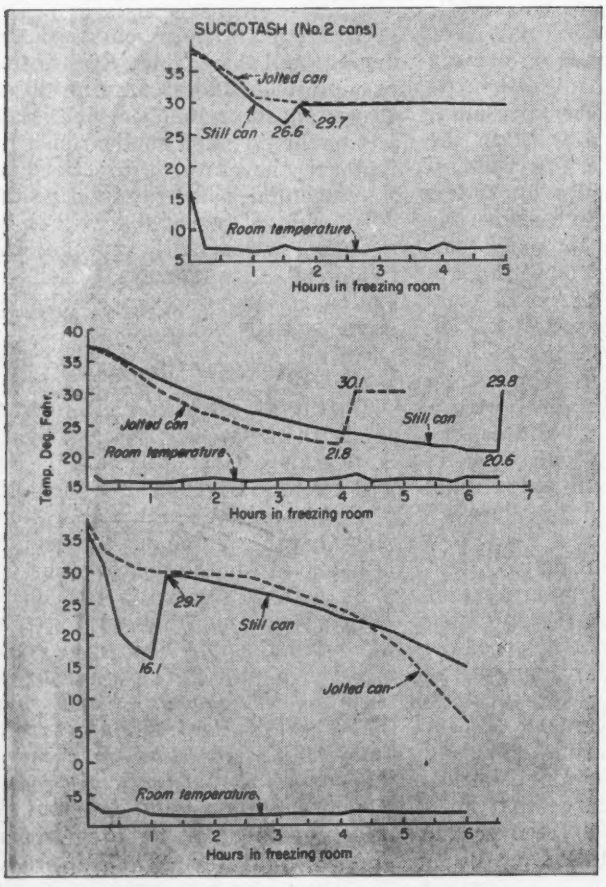
During a part of his assignment, the author was accompanied by K. S. Markley, Head of the Oil, Fat and Protein Division of the Southern Regional Research Laboratory, New Orleans, Louisiana, to whom he is indebted for the photographs.

Part II, to appear in the March issue, reports on the general method of refining edible oils from crude oils, the manufacture of margarine, reversion of soybean oil and remedial measures used, manufacture of fatty ethyl esters and their use in margarine, the commercial production of synthetic edible fats and the effect of the war on the German edible oil industry.—The Editors.

Freezing Point Data Sheets And Cooling Curves

PART VI





Spinach

Test Number	Freezing room temp. range	Commodity starting temp.	Time to reach freezing point (hr.)	Undercooling (hr.)	Undercooling (deg.)	Total time to freeze (hr.)	Freezing point
No. 2½ cans:							
1–Still.....	10.1–13.5	33.0	½	—	—	½	30.
1–Jolted.....	10.1–13.5	33.6	¼*	—	—	¼	—
2–Still.....	14.7–17.9	36.4	1¼	1¾	4.5	3	31.6
2–Jolted.....	14.7–17.9	34.5	¼	1½	0.1	1¾	30.6
3–Jolted.....	15.1–16.9	44.0	1¼	¾	2.7	2	30.5
4–Still.....	7.7–10.1	39.3	1	1¼	3.9	2¼	30.5
4–Jolted.....	7.7–10.1	38.6	2	—	—	2	31.5
5–Still.....	14.5–16.1	37.2	1½	3	7.3	4½	30.5
5–Jolted.....	14.5–16.1	36.7	2	¾	0.2	2¾	30.7

*Hours required to reach the freezing point of still sample.
Freezing point range, 30.2° F. to 31.6° F.; average, 30.8° F.

Inspections made immediately after the tests showed contents frozen hard to a depth of approximately 1 in. around sides of can with formation of ice in center.

Succotash

Test Number	Freezing room temp. range	Commodity starting temp.	Time to reach freezing point (hr.)	Undercooling (hr.)	Undercooling (deg.)	Total time to freeze (hr.)	Freezing point
No. 2 cans:							
1–Still.....	−8.2–−7.2	36.0	¼	1	13.6	1¼	29.7
1–Jolted.....	−8.2–−7.2	37.6	1½	—	—	1½	29.9
2–Still.....	15.3– 16.6	36.9	1¼	2¾	8.6	4	30.2
2–Jolted.....	15.3– 16.6	36.1	½	1¾	0.4	2¼	30.0
3–Still.....	15.9– 17.1	37.3	1¾	5	9.2	6¾	29.8
3–Jolted.....	15.9– 17.1	37.4	1¼	3	8.3	4¼	30.2
4–Still.....	6.4– 7.2	38.5	1	¾	3.1	1¾	29.6
4–Jolted.....	6.4– 7.2	38.0	1¾	1¼	0.3	3	30.1

Freezing point range, 29.6° F. to 30.2° F.; average, 29.9° F.

Inspections made immediately after the tests showed contents frozen stiff throughout can.

Sweet Potatoes

Test Number	Freezing room temp. range	Commodity starting temp.	Time to reach freezing point (hr.)	Undercooling (hr.)	Undercooling (deg.)	Total time to freeze (hr.)	Freezing point
No. 2½ cans:							
1–Still.....	16.7–18.5	34.8	1½	3¾	6.6	5¼	28.8
1–Jolted.....	16.7–18.5	35.4	1½	1¼	3.3	2¾	29.1
2–Still.....	16.3–17.3	35.9	2	2	4.6	4	29.6
2–Jolted.....	16.3–17.3	34.7	1	¾	1.8	1¾	29.1
3–Still.....	14.5–16.1	37.2	1¾	3¾	7.7	5½	29.2
3–Jolted.....	14.5–16.1	36.7	1½	¼	0.6	1¾	29.2

Freezing point range, 28.8° F. to 29.6° F.; average, 29.1° F.

Inspections made immediately after the tests showed contents frozen stiff throughout.

Acknowledgments

This research, an exhaustive investigation of the freezing of canned goods, was conducted by D. H. Rose, senior physiologist, Division of Fruit and Vegetable Crops and Diseases, USDA, and H. D. Johnson, transportation specialist, Transportation, Rates and Services Division, Office of Distribution, War Food Administration. M. N. Weatherhead, assistant mechanical engineer of the Fruit Growers Express Company, assisted the government officials in the investigation, which was conducted by the experimental cold storage laboratory of the Plant Industry Station, USDA, Beltsville, Md.

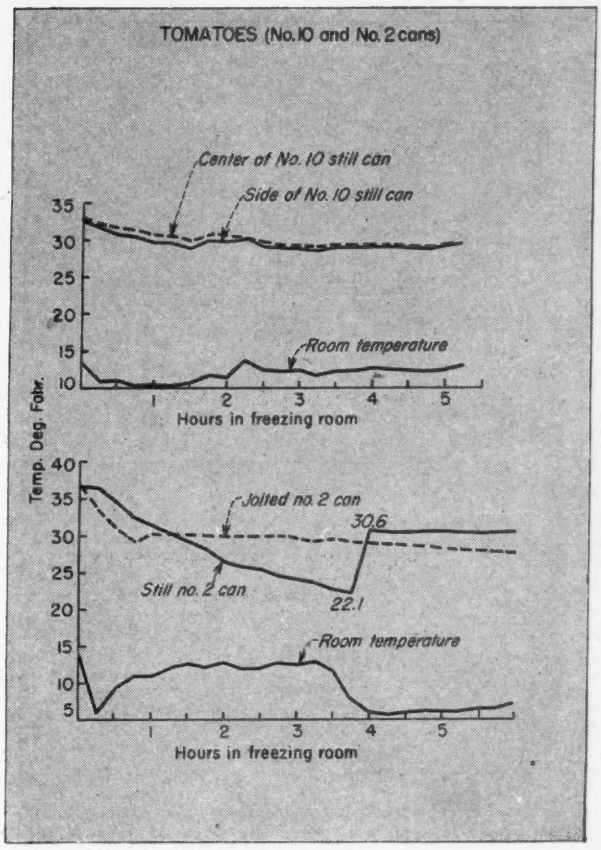
Tomatoes

Test Number	Freezing room temp. range	Commodity starting temp.	Time to reach freezing point (hr.)	Undercooling (hr.)	Undercooling (deg.)	Total time to freeze (hr.)	Freezing point
No. 2 Cans:							
1-Still.....	14.5–16.1	37.6	2	—	—	2	30.9
1-Jolted.....	14.5–16.1	36.4	1½	—	—	1½	31.1
2-Still.....	3.3– 1.7	37.3	¾	—	—	¾	30.8
2-Jolted.....	3.3– 1.7	36.6	1	—	—	1	30.5
No. 10 Cans:							
3-Still*.....	10.1–13.5	32.9	1	¾	1.2	1¾	30.8
3-Still**....	10.1–13.5	32.7	1	¾	1.3	1¾	30.0
4-Still.....	14.9–16.9	32.5	½	6½	8.5	Did not freeze	
4-Jolted.....	14.9–16.9	29.6	1¾	1¾	4.2	1¾	30.2
5-Jolted.....	13.9–20.5	34.9	1½	—	—	1½	30.5

Freezing point range, 30.0° F. to 31.1° F.; average, 30.6° F.

*Thermocouple in top center of the can.
**Thermocouple in top of can approximately ½ in. from the rim.

Inspections made immediately after the tests showed ice crystals around the sides of the No. 10 can. Ice formed to a depth of approximately ½ in. around the sides of the No. 2 can with heavy slush in the center. Frozen sample somewhat softer in texture and fuzzy in appearance.

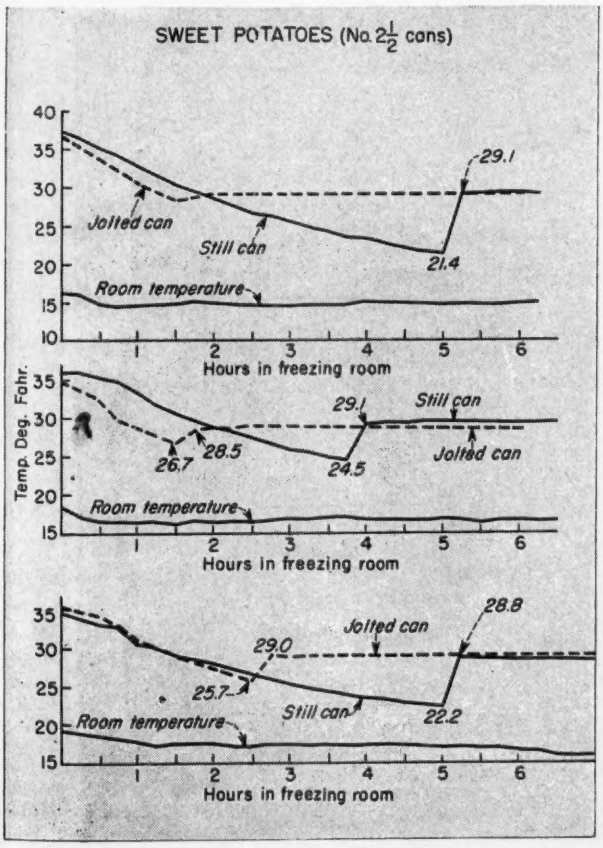


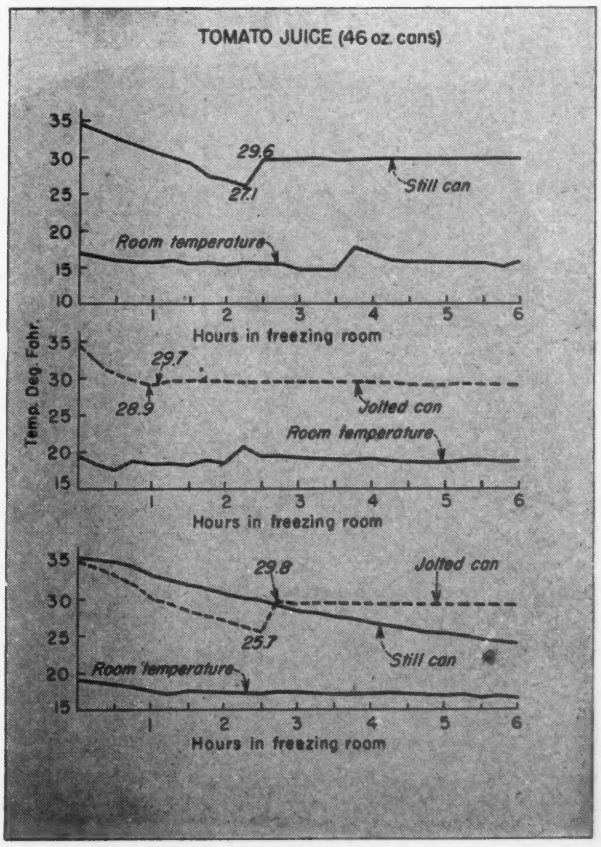
Tomato Juice

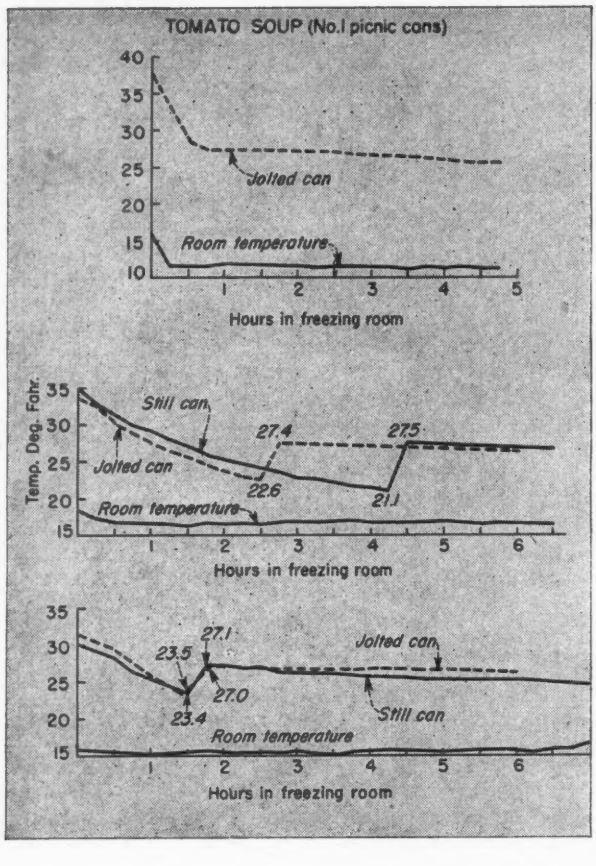
Test Number	Freezing room temp. range	Commodity starting temp.	Time to reach freezing point (hr.)	Undercooling (hr.)	Undercooling (deg.)	Total time to freeze (hr.)	Freezing point
46 oz. cans:							
1-Still.....	17.2–18.5	35.6	2¼	—	—	2¼	30.0
1-Jolted.....	17.2–18.5	35.2	1¼	1½	4.1	2¾	29.8
2-Still.....	14.9–15.7	33.4	1½	¼	0.1	1¾	29.7
3-Jolted.....	18.3–18.9	34.5	¾	½	0.8	1¼	29.7
4-Still.....	14.7–15.9	34.5	1½	1	2.5	2½	29.9

Freezing point range, 29.7° F. to 30.0° F.; average, 29.8° F.

Inspections made immediately after the tests showed contents frozen to a heavy slush. Hard freezing showed no effects.







Tomato Soup

Test Number	Freezing room temp. range	Commodity starting temp.	Time to reach freezing point (hr.)	Undercooling (hr.)	Undercooling (deg.)	Total time to freeze (hr.)	Freezing point
No. 1 picnic cans:							
1–Still.....	14.1–15.7	30.1	¾	1	3.6	1¾	27.2
1–Jolted.....	14.1–15.7	31.5	¾	1	3.6	1¾	27.2
2–Still.....	16.3–17.3	35.0	1¼	3¼	6.4	4½	27.5
2–Jolted.....	16.3–17.3	33.8	1	1¾	4.8	2¾	27.5
3–Jolted.....	11.1–11.9	37.1	¾	—	—	4¾	27.6
4–Jolted.....	16.0–16.7	37.8	1¾	¾	2.3	2½	27.3

Freezing point range 27.2° F. to 27.6° F.; average 27.4° F.

Inspections made after the tests showed contents stiff throughout, with ice crystals. Hard frozen sample when opened had a somewhat curdled appearance. On cooking both samples were of equally good consistency, flavor, and color.

Tuna Fish

Test Number	Freezing room temp. range	Commodity starting temp.	Time to reach freezing point (hr.)	Undercooling (hr.)	Undercooling (deg.)	Total time to freeze (hr.)	Freezing point
7 oz. cans:							
1–Still.....	14.9–15.7	35.3	1½	1	3.5	2½	26.5
1–Jolted.....	14.9–15.7	30.9	¾	2¼	8.2	3¼	25.6
2–Still.....	14.7–15.8	36.6	1	2½	6.4	3½	26.7
2–Jolted.....	14.7–15.8	36.3	¾	4½	9.2	5¼	26.4
3–Still.....	7.7–10.1	38.1	¾	1¾	9.0	2½	25.9
3–Jolted.....	7.7–10.1	39.4	¾	½	4.5	1¼	26.7

Freezing point range, 25.6° F. to 26.7° F.; average, 26.3° F.

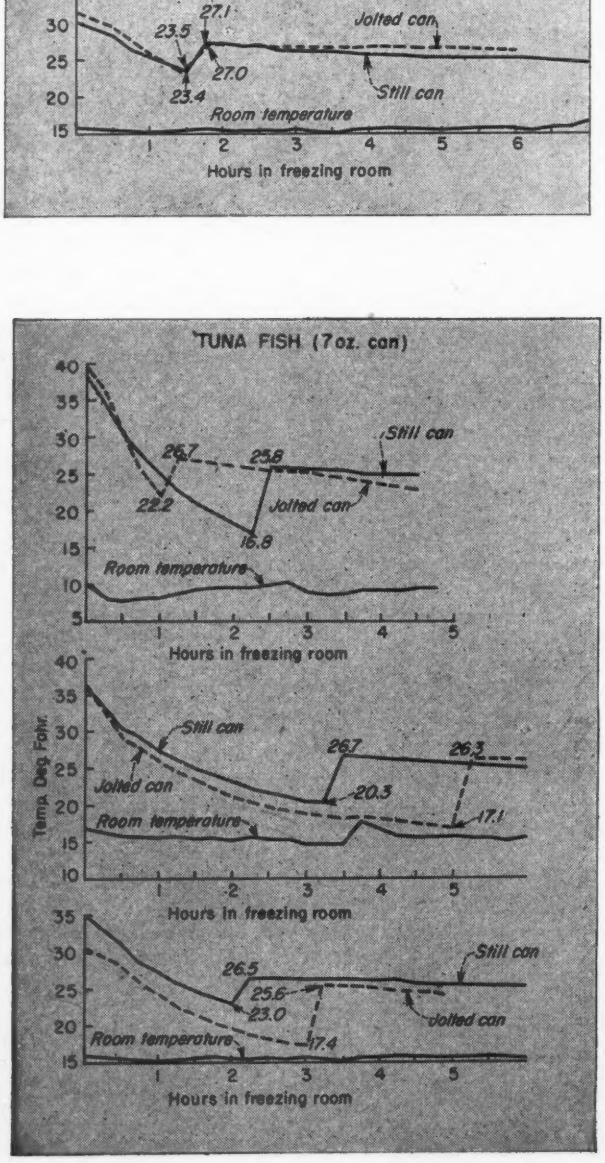
Inspections immediately after tests showed contents frozen solid.

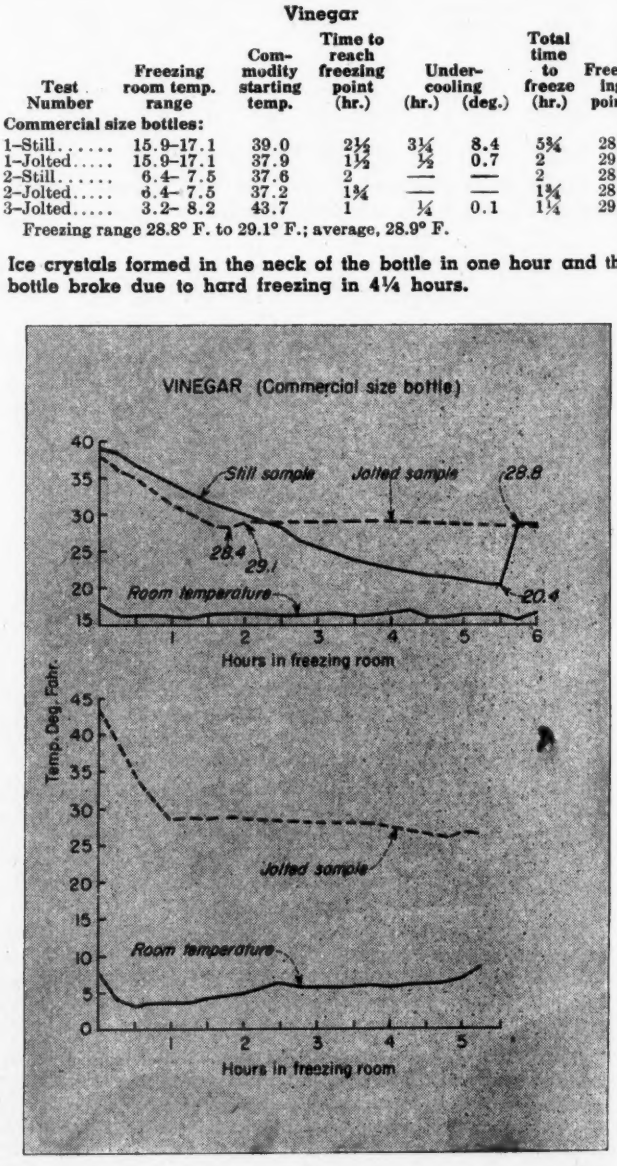
Vinegar

Test Number	Freezing room temp. range	Commodity starting temp.	Time to reach freezing point (hr.)	Undercooling (hr.)	Undercooling (deg.)	Total time to freeze (hr.)	Freezing point
Commercial size bottles:							
1–Still.....	15.9–17.1	39.0	2½	3¼	8.4	5¾	28.8
1–Jolted.....	15.9–17.1	37.9	1½	½	0.7	2	29.1
2–Still.....	6.4– 7.5	37.6	2	—	—	2	28.8
2–Jolted.....	6.4– 7.5	37.2	1¾	—	—	1¾	28.8
3–Jolted.....	3.2– 8.2	43.7	1	¼	0.1	1¼	29.0

Freezing range 28.8° F. to 29.1° F.; average, 28.9° F.

Ice crystals formed in the neck of the bottle in one hour and the bottle broke due to hard freezing in 4¼ hours.





LAWS and VERDICTS

Food manufacturers and distributors are particularly vulnerable to litigation involving liability of one sort or another. Here are some recent decisions on such varied aspects as warranty and liens, unfair competition and misbranding

By LEO T. PARKER, Attorney at Law, Cincinnati, Ohio

RECENTLY the higher courts rendered several outstanding decisions that should be of value to food packers and sellers in avoiding similar and expensive law suits. The cases involve rulings on such varied causes of litigation as warranty, liens, unfair sales practice, misbranding and personal injury. They are conveniently summarized here so that the reader may file them for future reference.

Circumstantial Evidence—According to a late higher court decision a retailer, wholesaler and manufacturer may be held liable in damages for sickness caused by eating impure food. Also, circumstantial evidence may be used as a basis for the decision.

For illustration, in *Vaccarezza* v. *Sanguinetti*, 163 Pac. (2d) 470, reported February, 1946, it was disclosed that a consumer sued for injuries caused by trichinosis as result of eating salami and coppe. In holding the retailer, wholesaler and manufacturer jointly liable the higher court said the evidence was convincing, although only circumstantial, that the meat was improperly cooked to kill the disease germs. This court said:

"The mere fact that a found fact is based upon circumstantial evidence and is used as a partial basis for another found fact does not of itself violate the reasoning processes permitted by our law."

Implied Warranty

All experts agreed that pork and bear meat are the usual hosts of the parasites, which cause trichinosis. Other meats, or poultry, can be infected by coming into contact with infested pork or bear meat. Poultry and meats other than pork are not eaten raw, however, and cooking normally will kill the parasites. The law implies that a manufacturer and retailer of cooked pork has thoroughly cooked it.

See *Baum* v. *Murray*, 162 Pac. (2d) 801, reported January, 1946. The higher court held that where sausage is purchased from a manufacturer-retailer in a sealed container, there is an implied warranty that the sausage is of merchantable quality, and that it is reasonably fit for human consumption.

In this case it was shown that a consumer contracted trichinosis from eating the sausage. The consumer sued the retailer, who also was the manufacturer, for damages. In holding the latter liable, the higher court said it is well known that pork must be thoroughly cooked to eliminate germs that cause the disease trichinosis, and that the manufacturer and seller impliedly warrants that he has thoroughly cooked the pork.

However, it must be realized that a seller of raw or uncooked pork cannot be held liable in damages for disease contracted by the purchaser who fails to properly cook the pork.

Lien Void — Modern higher courts consistently hold that the seller or owner of processed food holds a vendor's lien to secure payment only for merchandise that remains in possession of the processor.

For instance, in *Yosemite Growers Co-Op. Ass'n* v. *Case-Swayne Company*, 167 Pac. (2d) 541, reported May, 1946, it was shown that a company agreed to pack, can, process and market peaches delivered by an association and to account to the company for its stipulated share of the fruit and the proceeds of sales. The testimony showed that 80,200 cases of fruit, out of 82,169 cases of packed peaches had been sold by the company to various purchasers.

The question presented the court was whether the association held a vendor's lien on the canned goods.

In holding that the association held a lien on *only* the quantity of canned goods still in possession of the company, the higher court said:

"It is alleged that the defendants (company) sold 80,200 cases of peaches out of a total of 82,168 cases. We may assume from that alleged fact that the lien became valueless as security upon all of the canned fruit except from 2,000 cases."

Town Liable

Generally speaking, either a state, county or municipality is liable for payment of food purchased in compliance with valid laws.

For example, in *Great Atlantic & Pacific Tea Company* v. *Town of Bremen*, 64 N. E. (2d) 220, reported February, 1946, it was shown that the board of town auditors consented to the incurring of indebtedness for purchase of food by an overseer of the poor, who bought over $5,000 worth of food for the poor. The town refused to pay the debt, but the higher court held in favor of the seller.

However, this court clearly held that if the overseer had not strictly complied with the state laws, the town would not have been liable.

See *Consolidated* v. *Cass County*, 53 N. E. (2d) 738. In this case the higher court refused to hold a county liable for payment of supplies purchased by the Sheriff, who failed to comply with a state law, which specified that the contract of purchase must be approved by the county commission.

Not Unfair Competition

"Unfair competition" is the act of a seller in "palming off" his goods as those of a competitor. The color, shape, or size of containers cannot be appropriated as exclusive property of any seller or manufacturer.

For example, in *Winston & Newell Company* v. *Piggly Wiggly Northwest, Inc.*, 22 N. W. (2d) 11, reported April, 1946, it was shown

that a company had for many years sold coffee under the trade-mark "Red Rooster." Another company commenced to sell coffee under the trade-mark "Roaster Fresh." The bags in which the coffee was packed were *not* identical, but had similar colors.

In subsequent litigation the higher court held that the company that had adopted the trade-mark "Roaster Fresh" was not guilty of unfair competition.

Compensation Forfeited—In all states injured employees are required to file applications for compensation under the State Workmen's Compensation Act within one or two years. Failure to do so automatically forfeits the injured employee's right to compensation.

For example, in *Surratt* v. *Otoe Food Products Company,* 21 N. W. (2d) 862, reported May, 1946, it was shown that an employee on September 11, 1939, received personal injuries out of and in the course of her employment. On the day of the accident she was sorting corn, which was brought down to her on a conveyor. For four years she did not file an application for compensation under the State Workmen's Compensation Act. The higher court refused to allow the claim, saying:

"It is clear that, under the circumstances, the plaintiff's (employee's) cause of action is barred by the statute of limitations."

Double Fees Illegal—Under ordinary circumstances, and before enactment of the Clayton Act, a broker could legally accept payments from both a buyer and seller. Under modern law, however, it is illegal for a broker to accept commissions from both buyer and seller.

For example, in *Modern Marketing Service, Inc.,* v. *Federal Trade Commission,* 149 Fed. (2d) 970, it was shown that a firm is engaged in business of manufacturing, packing, and selling groceries under brands and trade-marks, leased by it from a broker, who acts as purchasing agent for buyers of the products.

The Federal Trade Commission alleged that the broker had violated the Clayton Act by accepting fees from the sellers, in addition to commissions received from the purchasers. The higher court held that brokerage commissions cannot be paid by sellers to a firm acting as the agent for buyers for services that are incidental to the firm's main activities on behalf of buyers, even though the services are genuine and of great benefit to the sellers. This court said:

"Even good faith on the part of both the broker and the seller cannot be utilized to escape the condemnation of the provision (Clayton Act)."

Bond forfeited—A manufacturer of food products who relabels food condemned by government agents may forfeit his bond.

In *Fresh Grown Preserve Corporation* v. *United States,* 143 Fed. (2d) 191, it was shown that the United States government agents condemned several hundred cases of food labeled "Pure Blackberry Jam" because use of the word "Pure" on the labels was false and misleading. The manufacturer had a bond, which guaranteed that he would not relabel the condemned food without supervision by the government representative.

The lower court held that the bond was forfeited, and the higher court approved the verdict because the manufacturer relabeled the food without government supervision.

Reasonable Delivery—If a sale contract fails to specify the exact date a seller will make delivery of purchased merchandise, the higher court will *imply* that the purchaser must accept delivery within a "reasonable" time, or not longer than four weeks from the date of the contract.

See *J. S. Brown* v. *Eugene Scallan,* 20 So. (2d) 732, reported April, where a seller sold a quantity of stored beans for $1,640. The buyer delayed six months in removing the beans from the warehouse, and the seller was required to resack 400 sacks of the beans partly eaten by rats. The seller sued the purchaser to recover the resacking expense, plus the cost of the bags, and other losses.

In holding the purchaser liable, the higher court said that where the contract does not clearly specify the delivery date, the purchaser must take delivery within a "reasonable" period of time. The purchaser is liable to the seller for resultant financial loss resulting from unreasonable delay in accepting delivery of merchandise.

Truck Vibrates

According to a new higher court decision, if stacked cartons of food falls on a customer he may sue and recover damages.

For illustration, in *Leone* v. *Safeway,* 44 Atl. (2d) 913, reported March, 1946, it was shown that prospective buyer was injured when several cartons of food fell on him as he was walking down a narrow aisle. The buyer proved that the fall of the cartons was caused by vibration of a heavy motor truck.

The jury held that the buyer entitled to recover $1,500 damages, and the higher court approved the verdict.

Broad Construction

In *United States* v. *Ruzicka,* 152 Fed. (2d) 168, reported April, 1946, the court construed the Agricultural Adjustment Act which authorized the Secretary of State to require handlers of milk to pay a stipulated amount on all milk "produced."

The higher court held that the Act does not deprive the handlers from appealing to a court when the decision of the Secretary of Agriculture is unsatisfactory.

Diseased Meat

In *Kurth* v. *Krumme,* 57 N. E. (2d) 177, reported in May, 1946, the higher court held that smoked pork sausage, commonly known as metwurst, infected with trichinella, is "diseased" within meaning of pure foods statutes. Therefore, when it is manufactured from fresh pork, containing such parasites, its sale is a violation of pure food statutes, even though manufacturer had no knowledge of the presence of the parasites.

Hold Standards

Misbranding — The Federal Food, Drug, and Cosmetic Act provides that "a food is misbranded if its labeling is false or misleading in any particular".

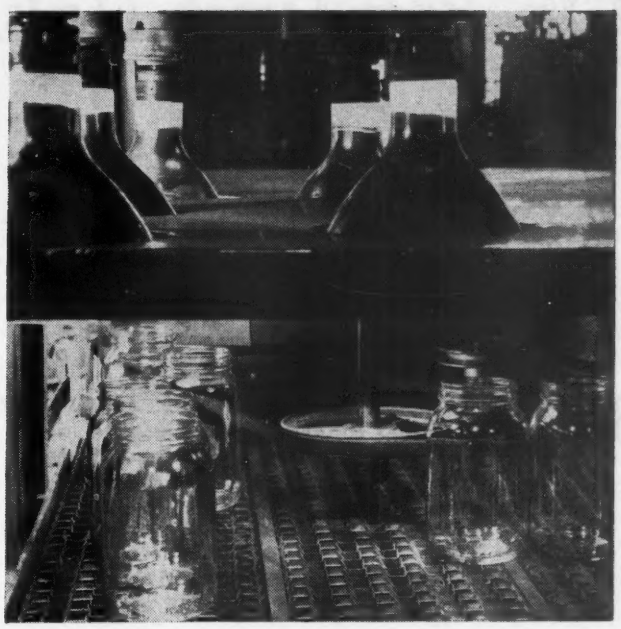
Recently, a Federal Court construed this law to mean that a food product is misbranded if its label varies from established standards of the product.

See *United States* v. *254 Cases Brand Tomato Sauce,* 63 Fed. Supp. 916, reported March, 1946, where the government seized a shipment of a product labeled as "tomato sauce" because it was not spiced, and contained only 6.5 percent of salt-free tomato solids instead of 8.37.

The government proved that "tomato sauce" is generally understood by the trade and consuming public to comprise a spiced, concentrated tomato product, which contains at least 8.37 percent of salt-free tomato solids. The government

(*Continued on page* 220)

Container Breakage Reduced By Infrared



Installed over unscrambling table and feed conveyor, lamps preheat jars before they are filled with hot molasses. They dry condensate which caused labeling difficulty

By J. ROBERT HEILMAN, Production Manager
American Molasses Co., Brooklyn, N. Y.

INFRARED lamps have solved two packaging problems at the Brooklyn, N. Y., plant of American Molasses Co. They preheat the glass jars to eliminate breakage, and at the same time evaporate condensate that previously had interfered with labeling.

In winter, empty jars are received from the storage warehouse at temperatures as low as 40 deg. F. When they are brought into the filling room, moisture from the air condenses on the jars and interferes with the labeling operation. On some occasions as many as 50 percent of the labels fell off.

But even more serious was the breakage when the cold jars were filled with hot molasses. Not only did this involve a considerable loss of material, but it occasioned frequent shut-downs of the entire packaging line for the removal of molasses from the conveyors.

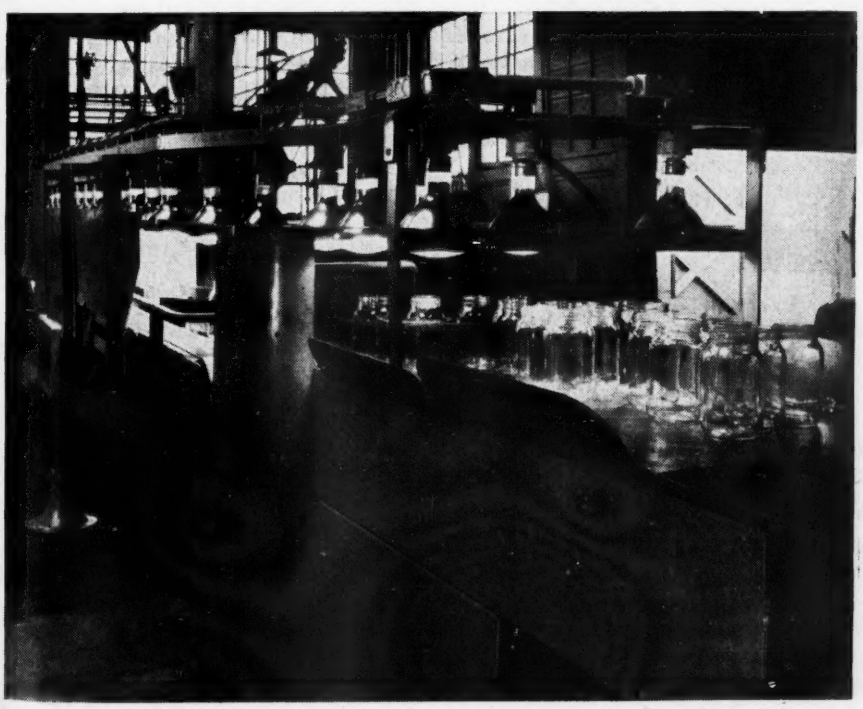


Fig. 1. Infrared lamps over unscrambling table and discharge conveyor dry condensate on glass jars and heat them to avoid breakage when they are filled with hot molasses.

By the installation of infrared lamps, jar breakage has been practically eliminated and labeling troubles have disappeared. The hood of the jar-unscrambling table was extended to the end of the delivery conveyor, and 18 250-watt infrared lamps have been installed (Fig. 1). The heat from the lamps evaporates the moisture which had prevented the adhesive on the labels from working properly. By the time the jars emerge from the extended hood their temperature has been raised to approximately 80 deg. F.

A gentle blast of warm air plays over and into the jars as they roll from the conveyor and over the chute to the labeling machine. This provides additional insurance against condensation, and removes any lint which may have gotten on the jars during storage. Adhesion of the shellacked-on labels now approximates 100 percent.

With the jars passing to the filling machine at moderately warm temperatures, the internal stresses set up when they are filled with hot molasses are minimized, and breakage from this cause has been practically eliminated.

Use Double Bottoms On Big Unit Deliveries

Three vehicle train spreads heavy load on five axles and permits dropping of 18,000 lb. delivery in a single unit, while the larger trailer continues on its route

DOUBLE bottoms, the automotive designation for a semi-trailer and a four-wheeled trailer pulled at the same time by one tractor in a train of three-vehicles, are employed on certain routes by Lee & Cady, Detroit, wholesale food distributors, in the delivery of groceries to over 15,000 retail stores in the State of Michigan and in parts of Indiana and Ohio.

On such a train the gross weight per axle, one of the most important factors affecting road wear, is no greater than on a conventional two-axle truck or on a six-wheeler with three axles. Further, the distribution of the greater payload and gross vehicle weight over a greater length by the use of at least five axles, does not overload the highway bridge spans.

Reduces Time

But Lee & Cady use the double bottom-principle to gain another advantage, the reduction of elapsed unloading time on the delivery route and driver and helper overtime. The four-wheeler is dropped at an intermediate stop where it is unloaded by store help while the driver and helper proceed with the tractor and trailer to the end of the route. The empty four-wheeler is picked up on the return trip.

In the double bottom hook-up, the semi-trailer carries a load of approximately 25,000 lb. and the four-wheeler, 18,000 lb. Thus the double-bottom operation cannot be applied with full efficiency unless the intermediate stop takes a delivery of 18,000 lb.

The double bottom routes, therefore, are chiefly those in which a full four-wheeler trailer load of not less than 18,000 lbs. can be dropped at a company-owned, cash-and-carry or supermarket type of store.

The 15,000 retail stores served by Lee & Cady in Michigan, Indiana and Ohio are reached from six main service branches, five in Michigan and one in Ohio. The Michigan branches are located in Detroit, Grand Rapids, Saginaw, Jackson and Kalamazoo and that in Ohio at Toledo.

Service Branches

Approximately 4,000 stores are served from the Detroit branch. Still other stores, in addition to the 15,000 served from the company's six main branches, are covered from three semi-service branches, two in Michigan at Traverse City and Lansing and one in Ohio at Lorain.

The delivery area covered by the six main and three semi-service branches covers the entire lower peninsula of Michigan and parts of northern Ohio and northern Indiana. The eastern boundary of the delivery area is Lorain, Ohio; the western limit is South Bend, Ind., served from Kalamazoo, and the southern limit, South Bend, Ind. and Bellefontaine, Ohio. The double bottom routes are all operated from the Detroit branch. The towns served include Port Huron and Adrian, Royal Oak, Ypsilanti, Ann Arbor and Mt. Clemens.

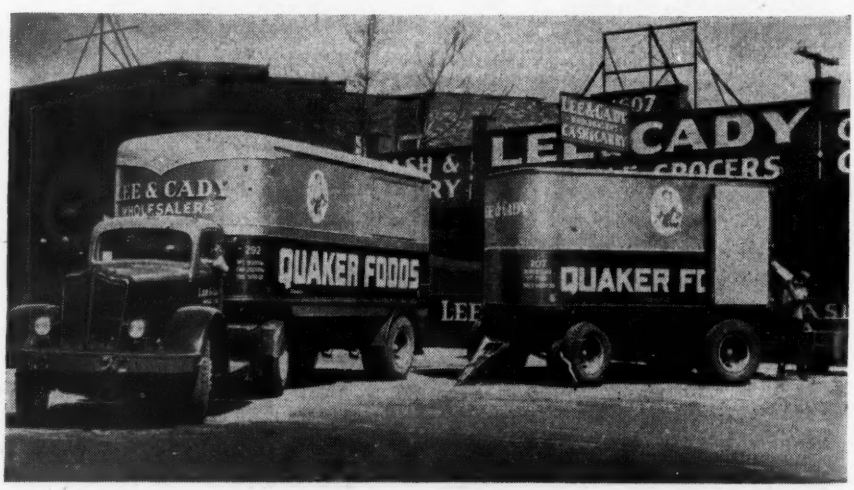
The Lee & Cady trucks and tractors are made up of Fords, Macks and Whites. The semi-trailers and four-wheeled trailers are Fruehaufs. The Detroit equipment is made up of 10 straight trucks, 10 tractors, 18 semi-trailers and 2 four-wheeled trailers.

The overall length of the double bottom units is 50 ft. in compliance with the Michigan State motor vehicle laws. The semi-trailers have 20 ft. panel bodies and carry loads of not over 25,000 lbs. The four-wheeler load limit is 18,000 lbs.

Two-to-One

Eighteen semi-trailers and ten tractors operate out of the main Detroit branch. It is to be noted that the ratio of semi-trailers to tractors is almost two to one. This ratio has been built up purposely to provide approximately two semi-trailers for each tractor so that one empty trailer may be loaded while the tractor is out on the route delivering from the other trailer.

Besides often permitting two trips a day when otherwise only one could be made, and the reduction of driver and helper overtime, the trailer-over-tractor surplus also stabilizes the work of the warehouse loading crew and tends to reduce its overtime. The extra trailers enable them to be loaded without idle periods waiting for empties to come in off the routes. With such idle periods eliminated, a given tonnage can be loaded in less time, often without overtime.



The small trailer has just been dropped at one of the large Lee & Cady stores, where it will be unloaded while the tractor-trailer continues deliveries along balance of route.

EDITORIALS

LAURENCE V. BURTON, Editor

How the "Price" of Butter is Determined

THE sorrows of the Dairymen's League Cooperative Association call to mind that very few people know how the price of butter is established in the New York market.

Every trading day a group of men get together at 10:00 A.M. in the New York Mercantile Exchange. They buy and sell butter for 15 minutes. All transactions occurring during the trading period are recorded. Then a representative of Urner-Barry Publishing Company, a market reporting house, proclaims the official prices prevailing for that day.

Of course, this does not mean that all butter must be sold during those 15 minutes. It means only that the trading during that quarter-hour is the basis of the published price for that day. At any time in December anyone could have momentarily pushed the "price" up or down with a relatively small cash outlay.

Even before the Dairymen's League price fiasco there has been criticism of the shortness of the trading period and the desultory character of the trading and relatively small total volume of the transactions that are used to establish the official price of butter. Some persons believe it would be better to follow the practice of the Chicago Board of Trade or the big stock exchanges and record all transactions occurring during the entire day instead of for 15 minutes.

As matters now stand the official price of products traded on small exchanges is regarded as a bit artificial.

Army Forehandedness

IT is gratifying to learn from the Research Program of the Office of the Quartermaster General that the Army is taking aggressive steps to apply the latest developments in food technology to the subsistence of troops. The QM is not waiting for the next war to initiate improved methods.

To be specific, the QM has one project, "to anticipate the application of precooked meats to military feeding." Another project anticipates the probable application of "prebaked frozen foods (pies and cakes) to military feeding as the frozen precooked foods industry continues to develop."

More important than the Army's forehandedness, however, is the plan of study of these new items. Members of the infant precooked frozen food industry would do well to study the Army plan of research. In the prebaked frozen food project there are five steps in the research:

1. Determine the most suitable formulas.
2. Experiment with various packaging and freezing methods to establish optimum conditions from the standpoint of quality **and stability** (our emphasis).
3. Determine the critical temperatures for storage and transportation.
4. Devise comparative methods of testing, preparation and reheating to determine acceptability.
5. Determine nutritive value (vitamin and amino acids) of various types of recipes and changes that occur therein on storage, thawing, and baking.

The Army is to be complimented on taking the initiative in these investigations in a manner comparable to the most foresighted industrial food processor. Should the time ever come when the Army would need precooked frozen items for field operations, it is predictable that its dependence on industry for guidance will thus be minimized.

Those in industry who are wont to be skeptical of the value of research in this field of precooked frozen foods will find encouragement to revise their policy by a review of the five point research program undertaken by the QM.

Award for Achievement In Food Technology

To be granted for progress between Pearl Harbor and June, 1946.

A temporary modification of the rules governing the award for achievement in food technology is announced.

The time in which a company shall become eligible to receive the 1947 award extends backward to Pearl Harbor. Hence, if your company has put into successful technological production, between December 7, 1941, and June, 1946, some new development in food technology, engineering, cost reduction, or has produced a new food, it is eligible for consideration by the Jury of the Award.

Names of the jury are given on page 80, December, 1946, FOOD INDUSTRIES. Send your suggestions or company application to any juror, or to the Editor of FOOD INDUSTRIES, who is acting as secretary of the jury. The secretary of the jury has no vote; he merely transmits your ideas to all the jurors.

You can nominate some achievement by your own company or by some other company. Please act promptly.

A company is to receive the award for achievement—not an individual whose brainchild the achievement may have been. The idea is to encourage companies to greater progress.

Claim Racket Growing

WITH the return of certain odd characters to metropolitan sidewalks it is expected there will be other manifestations of normalcy, including the consumer claim racket.

During the war the number of such claims reported by one association dropped from 2074 in 1941 to 687 in 1945. But the days of easy money in munitions plants are gone, the sure-thing folks are now preparing to move in on the unwary food manufacturer.

The harder it is to earn a living by working, the larger the number of consumer claims, holdups, auto thefts and the like. Since it is not good form to discuss racket technics publicly we respectfully refer you to your own counsel for the necessary precautions to be taken to prepare for potential claims. Nuff sed.

What We Lost in 1946

FOR the record: BLS figures show that 107,475,000 man-days of work were lost in 11 months in 1946, equivalent to about 110,000,000 man-days for the year, because of work stoppages.

This figure triples the worst previous record, made in 1945.

At 300 working days per year, the time lost was 366,666 man-years.

If 188 people had worked steadily from the Birth of Christ, at 300 days a year, their working time by the end of 1946 would have been about equivalent to the time lost in this one year as a result of strikes.

Quality Limitations of Fluming

FLUMING, or conveying a solid in a stream of water, is an excellent materials handling technic provided its limitations are respected.

The major limitations are that the material is not injured by short time immersion in water and that nothing of value can be readily dissolved from the material. Thus fluming is useful for conveying sugar beets by virtue of its economy and the removal of adhering earth. Similarly fluming has been successfully used for conveying citrus fruits, tomatoes, strawberries, cranberries, peas, and fish.

Chopped green peppers have also been handled in a water suspension; but here the solution of any soluble materials from the peppers has not constituted a problem because the product becomes desirably milder in flavor; furthermore the chopped peppers were an ingredient in a formula that depended chiefly on the other constituents for its characteristic flavor.

Cut sweet corn, on the other hand, has so mild a flavor and possesses so little sugar that fluming of this product becomes a technological hazard to quality. A long trip in water can remove so much of the soluble material from the cut faces of the kernels that what remains, though edible, may lose all character. This is one of the sources of poor quality that has been noted in several quick freezing plants.

Nevertheless, the use of the flume is permissible even for cut corn, provided that the time of travel in water is kept very short. Lengthy immersion being ruinous to quality of cut corn, it is impractical to use long flumes. Short flumes, on the other hand, involve the use of just as much equipment as long flumes to dewater the material. For short travel, it would seem to be better engineering to utilize dry mechanical handling, such as a helicoid conveyor or rubber belt. Either must, however, be kept properly clean.

If one keeps within limitations, the flume is an excellent method of moving certain food raw materials.

Alamalt

ALAMALT—in case you run across the term—is a flour made by grinding sweet potato crisps. The crisps are made by cooking sweet potatoes, then pulping, extruding and toasting under controlled temperature and humidity plus high air velocity. The name appears to be a combination of ala for Alabama with malt.

Alamalt is not the same as dehydrated sweet potato flour, but is a precooked product—in fact doubly precooked. Sugar content runs from 38 to 42 percent.

Developed by Alabama Agricultural Experiment Station, it is an effort to create higher valued products from the sweet potato. In some products it is said to possess a definite moisture holding property, as well as a caramel flavor.

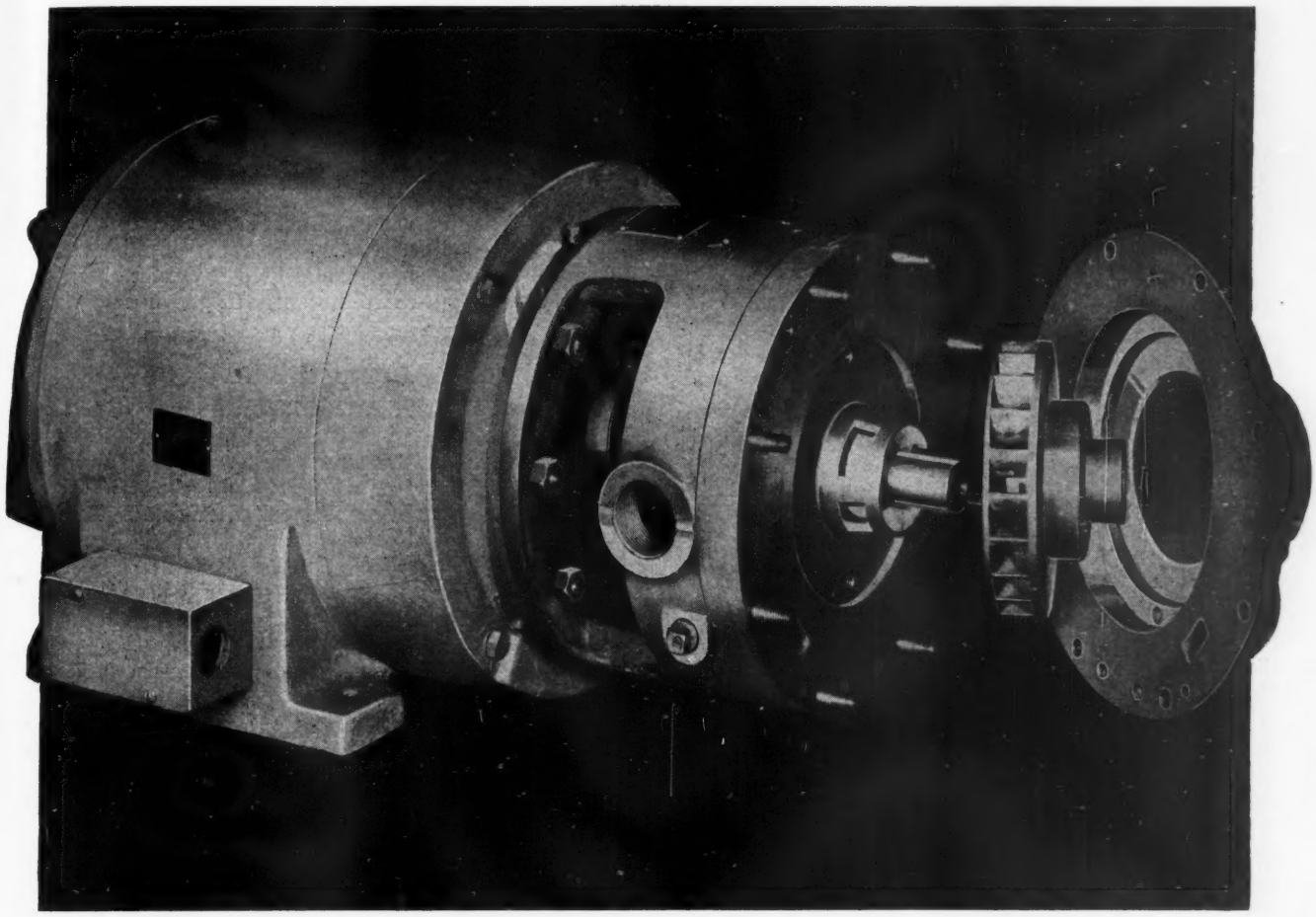
As far as we know, production of Alamalt or its relative Alayam has not been started in a commercial way.

U. S. Food Consumption Up

"PER capita consumption (of foods) in the United States is 15 percent higher than before the war, and higher than that for last year. The biggest increase has been in the more expensive foods. The United States is the only large country where there remains a choice of exporting more rather than less. This is particularly true of grain, meat, and fats."

The foregoing is an excerpt from the Third Quarterly World Food Appraisal by FAO, released by Sir John Boyd Orr on December 26, 1946. When we see ourselves in the perspective of a world viewpoint, we realize how much more fortunate this country is than any other.

The Nash Clean-Air Compressor has but one simple moving part.



The Nash Clean-Air Compressor has but one moving part, cast in one piece and rotating in the pump casing without metallic contact. No internal lubrication is necessary; therefore air or other gas compressed with a Nash is entirely free from oil contamination.

Dust and heat are removed from the air, or gas compressed, by the unique Nash "Liquid Piston". Air from a Nash Compressor is therefore delivered free from dust, heat, or oil, without supplementary filters or air washers, in a perfected mechanical structure with no internal wearing parts.

Air or gas from a Nash Compressor may be used for agitating, blending, maintaining pressure on storage tanks, or moving liquids and materials by pressure displacement, in connection with the most delicate food, beverage, or chemical process, without danger of contamination.

Bulletin D-252 tells all about Nash Clean-Air Compressors, and it is free on request.

THE NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.

NEW PACKAGES & PRODUCTS

Follow Trend

DISTRIBUTION of Jack Frost sugar in redesigned packages has begun throughout the territory served by National Sugar Refining Co. This is the first major innovation in the company's containers since 1927.

The revised design features a new lettering style, different color combination for each grade of sugar and an improved opening which forms a spout for pouring. The trade mark figure of the Jack Frost boy and the size and shape of the packages remain the same.

Recipes, together with useful information about the various grades of sugar, are displayed on the panel of the smaller consumer packages. They are lettered in blue on white and can be clipped for reference.

The basic design will be applied to containers of all sizes in which Jack Frost sugar is packaged—cartons, paper and cotton bags, balers and corrugated containers.

Two glossy colors are used on white stock. The background is predominantly a deep, bright blue. Distinction between three grades of white sugar is established by the use of three different background blues. The grade name is set apart in a contrasting red rectangle. Packages of light and dark brown sugars are distinguished by light and dark brown backgrounds with a red rectangle to inclose the grade designation.

High Vacuum Process

WITH the end of the war, National Research Corp., Boston, has returned to its prewar interest in coffee.

The company is attempting to perfect a pure soluble coffee that can be made quickly, conveniently and economically by the addition of water without loss of flavor.

Prior to the war, National Research Corp.'s staff conducted experiments to prove that a fine soluble coffee could be made by evaporation at low temperatures under high vacuum. The process has now been brought to the pilot plant stage, the product being tested by a large group of typical users.

During the process, fine unadulterated coffee is brewed in a manner which preserves all the original elements of flavor. None of the undesirable bitter tastes are extracted from the bean. The water is removed from the liquid coffee at low temperature by the company's high vacuum diffusion process. The product takes the form of fine grained brown and gold crystals which dissolve instantly in hot or cold water.

Army Ration

A NEW chicken dinner, packed in a 12-oz. can, is being developed by the Quartermaster Food and Container Institute for the Armed Forces in collaboration with C. A. Swanson and Co., Omaha.

W. Clarke Swanson has announced that it will be a combination white and dark meat cooked with Irish potatoes, fresh peas, pearl barley, pimientoes and seasoning.

Samples of various combinations of the ingredients have been processed and submitted to the experts on the Institute's taste panel in Chicago.

When the chicken dinner satisfies the most critical member of the taste panel, a trial production will

be made. The product will be given its official test by troops on maneuvers in the field. They will eat it, hot or cold, under simulated battle conditions and in combination with the beverage component of the Army's new combat or "E" ration.

Upon unanimous acceptance by the G. I.'s, the chicken dinner will be added to the Army's present list of approximately 60 approved meat items.

Meal-on-a-Plate

ABOUT twenty different menus are being offered to New York City housewives in the cooked, frozen complete meals of Maxson Food Systems, Inc., New York. National distribution is to follow shortly.

The meals, originated for air travelers, are contained in a new package of cardboard enclosed in cellophane. Color design is done in red, blue, yellow and black.

The entree, enclosed in cellophane, and the two vegetables are on a fiber plate of three compartments. An aluminum sheet above the meal is adjusted by the consumer so that its ends project over the long sides during cooking in the plate.

Meals are heated for 25 minutes in a 400 deg. oven.

Foil Candy Wraps

CHASE CANDY Co., St. Joseph, Mo., is said to be the first candy manufacturer to package bulk candies in foil.

The company has been working for the past two years with Reynolds Metals Co. in the designing and processing of the foil fresh package.

The result is a wrap that is heat-sealed, retaining the candy's factory freshness. No moisture can leave or enter through the foil, making the package suitable to any climate. The foil wrapper acts as a reflector of heat, and destructive light rays are turned aside so that there is no loss of flavor, discoloration of the candy or escape of fresh aroma.

The burgundy and gold High Crest box was placed on the market last spring. It contains 19 varieties including creams, caramels, chips, chews, cordials and nut centers.

More recently introduced were the Pony Express and Showboat Chocolates. These differ from the High Crest package in that the pieces are larger with only 12 varieties.

A series of historical events will be brought to the consumers' attention by placing inserts in each box. The Showboat package will contain inserts relative to the showboat era on the Mississippi, Ohio and Missouri rivers. The Pony Express box will carry inserts recalling the riders of that colorful era.

He can't tell what he is doing or what he is going to catch.

It's the same story with packaging. When you select just any package for your product, without the advice of "enlightened", package-wise men, the results are anyone's guess. Chances are, they won't be good.

Packaging should be planned by experts . . . planned for your particular product . . . to give the exact results you want. Planned to retain freshness, protect in handling, function smoothly on a production line. And the outer box should be sales-wise.

Bring your problem to Twitchell . . . let the experts in the Packaging Division find your answer.

Paksure
FOOD PACKAGINGS

Glassine, Wax Glassine and Cellophane in Rolls and Sheets; Bags and Envelopes of Wax Glassine and Cellophane.

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SALES OFFICES
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Consistent consumer recognition of your product — thru eye-appealing packages — is real assurance — and certain insurance for bigger sales.

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plants at | Milwaukee, Philadelphia, Los Angeles, San Francisco, Tucson, Vancouver, Washington

Mill at De Pere, Wisconsin

PACKAGING HEADQUARTERS TO AMERICAN INDUSTRY

Foil Label

A NEW label that affords maximum visibility of the product and compliments the color and beauty of the jar's contents is being used by Kadota Fig Association of Producers, Merced, Calif., for Tropic Kadota Figs.

The aluminum foil label was developed and designed by Reynolds Metals Co., Richmond, Va., under the supervision of James Birnie, Jr.

Cheese Spread

KRAFT FOODS Co., Chicago, is distributing a new cheese spread called Burgette—pronounced with a hard "g".

It is described as a new type of cheese with soft texture, mellow, rich and delicate in flavor.

The spread, packed in 6-oz. screw-top jars, may be used in sandwiches, on crackers or as a dessert cheese.

These 6 Advantages of

OAKITE CLEANING & SANITATION MATERIALS

add up to BIG SAVINGS *for you*

SPEED

Oakite materials are scientifically balanced for quick, easy cleaning ... help eliminate costly manual methods ... enable your workers to do more cleaning in less time. Lower your cleaning costs with fast-acting Oakite materials!

REDUCED DOWNTIME

Meat-packer, canner, fish processor ... the speed and efficiency of Oakite cleaning sends back into profitable production your vital equipment, without excessive time loss. And this reduced downtime produces more profit per unit of product.

THOROUGHNESS

No costly, time-consuming "do-it-over-and-take-longer" directives when Oakite techniques and detergents complete the cleaning or descaling job. Equipment surfaces are efficiently prepared for easy, improved bactericidal procedures.

LONGER EQUIPMENT LIFE

An Oakite cleaning-sanitation procedure can assist in prolonging the life of your important processing units. A local Oakite Representative will freely help you set in motion an economical program designed to help preserve equipment surfaces.

PRODUCT PROTECTION

Aimed at low bacteria counts in food plants, the Oakite sanitation program helps assure product purity; helps preserve flavor. Oakite germicidal agents reduce the danger of profit-lowering spoilage from odors, bacteria and mold.

FREE JOB DIGESTS

Digests of job procedures covering hundreds of commonly recurring tasks in meat-packing plants, canneries, fish-packing installations are freely available. Whatever your cleaning or sanitizing problem, consult Oakite. Write on letterhead TODAY!

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Technical Representatives in Principal Cities of U.S. & Canada

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REG. U. S. PAT. OFF.

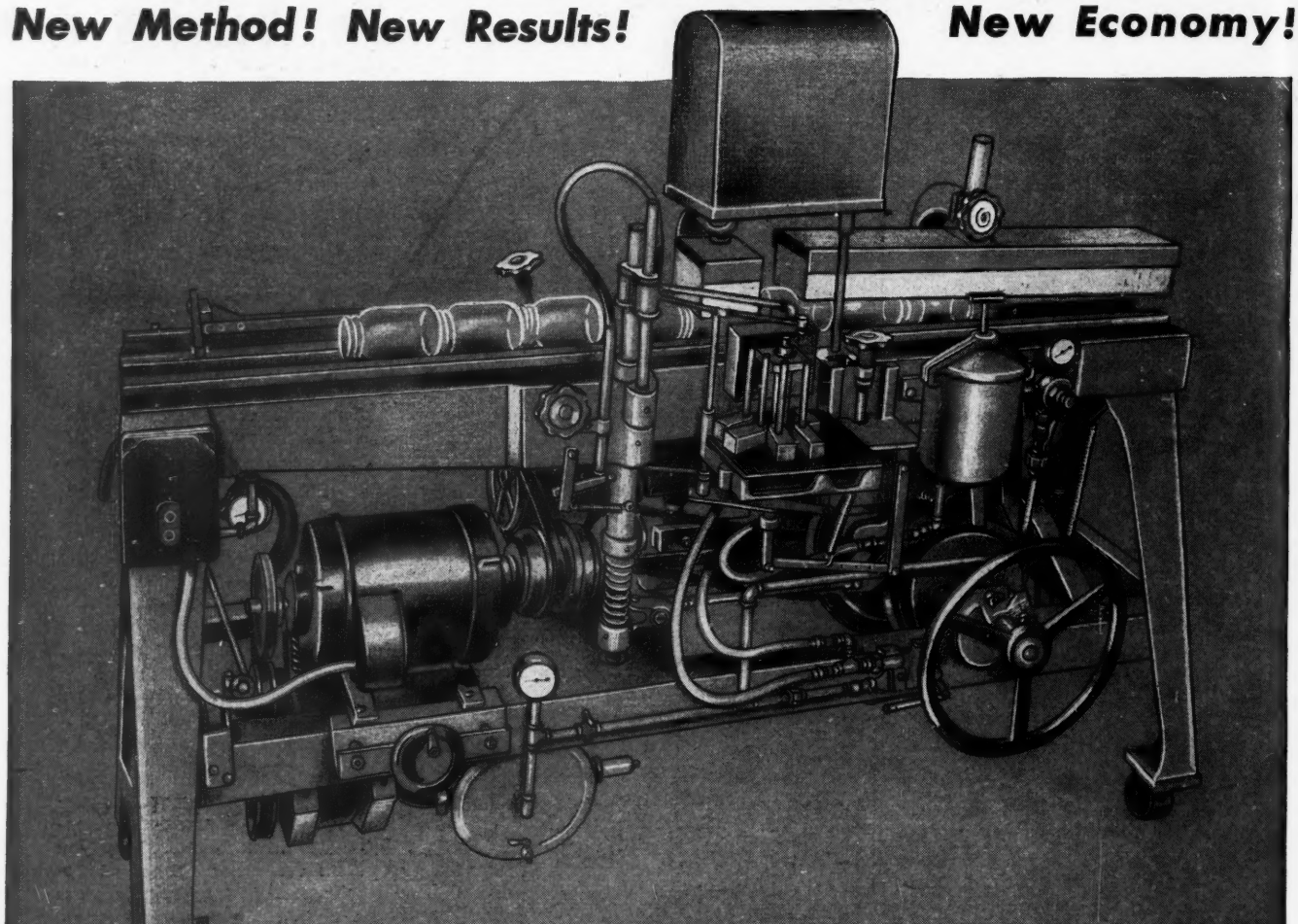
Specialized Industrial Cleaning

MATERIALS • METHODS • SERVICE

Introducing...

THE NEW VAC-SPRAY LABELING MACHINE

New Method! New Results! ***New Economy!***



The Label Chief is a Miracle Machine designed for modern methods of efficient operation.

The Label Chief is the ONLY labeling machine, *regardless of cost,* equipped to handle a wide variety of labels and containers without expensive extra attachments or stoppage of production lines for change-overs.

CHECK THESE ADVANTAGES:

The Label Chief applies gummed, ungummed, lithographed, embossed, varnished, or plain labels of any shape, from the size of a postage stamp up to five inches long or wide.

Containers to be labeled can vary from ½ ounce to gallon jug, of glass, metal, porcelain or cardboard... round, square, triangular or private mould.

Spray application and vacuum label pickup insure fast thorough attachment of labels. No hand-wiping of labels after emergence from labeler.

Lowers labor cost. Fewer operators needed with automatic operations of simple-to-master, long-lasting Label Chief.

Mounted on casters for easy movement. Increases efficiency with neater results.

Approximately one minute required for change-over to different size, shape, or kind of label or container.

The Label Chief Saves Time! Saves Labor! Saves Equipment! Saves Money!

FAST DELIVERY ON ALL VAC-SPRAY MACHINES... WRITE FOR INFORMATION

VAC-SPRAY MACHINE CORPORATION

607 22nd AVENUE, N. E. MINNEAPOLIS, MINNESOTA

FOOD INDUSTRY NEWS

GENERAL

Stable Markets Predicted As Canners Open Convention

Raw material costs have passed their peak, but no price decline is indicated for labor or other materials in 1947

Reassurance on price and demand was evident at the keynote session of the 40th annual convention of the National Canners Association, in Atlantic City, January 20 to 24. While spokesmen were not always in complete agreement on minor aspects of the situation, it was predicted that business will continue at good levels with satisfactory, if somewhat lower prices prevailing. Emphasis was placed on quality products and efficient operations.

It was generally agreed also that the 1946 fruit and vegetable crop for processing would have moved on to consumers before the 1947 crop year begins. Points supporting this view were the expanding consumer demand resulting from population increases and maintenance of buying power through high employment and equally high payrolls.

Two factors were listed as certain in the makeup of canners' costs. Labor charges, it was noted, will not be reduced, nor will the cost of materials such as cans and cases. Raw material costs, however, have passed the peak. Canners should avoid paying prices which in terms of finished goods will be resisted by the increasingly price conscious public. Quality, however, should not be sacrificed, since it will remain the key to price.

Among those taking part in this all important keynote panel were: H. F. Krimendahl, vice-president of Stokely-Van Camp, Inc., E. N. Richmond, president, Richmond-Chase Co., E. A. Myer, assistant administrator, PMA, Guy E. Reed, Harris Trust Co., and Francis Whitmarsh, president, National - American Wholesale Grocers Association.

Little change in the supply of available cans was seen as the output of black plate will continue to be more of a limiting factor than the shortage of tin. Allocations may be expected to continue until mid 1947, at least. This can shortage, it was predicted, will act as a restraint on high production that might tend to force prices down.

Aid for N.C.A. members in labor relations problems was promised by Emil Rutz, newly elected N. C. A. president, who succeeds Fred A. Stare. Mr. Rutz is president of the Schuckl Co., Sunnyvale, Calif., Howard T. Cumming, president of Curtice Bros. Co., Rochester, N. Y., was elected vice-president, while Carlos E. Campbell and Frank E. Gorrell continue as secretary and treasurer respectively.

Three overall features were evident among the canning machinery exhibits—more automatic devices to keep production and packaging lines moving, improved designs on equipment to simplify sanitation routine, and greater emphasis on labeling and on package "dress." The glass container is making a determined effort to hold wartime gains with the canners. On the other hand, the exhibit revealed increasing attention to methods of preservation, other than canning, particularly freezing and dehydrating. More operating and fewer static exhibits were in evidence, one in particular making itself apparent. This was an 80 H. P. boiler, oil fired and generating steam.

Orange Concentrate For School Lunch Program

THE U. S. Government has awarded contracts totaling nearly $450,000 for 200,000 gal. of orange concentrate to two Florida firms, the Pasco Packing Co. and the West Coast Growers' Co-Operative, both of Dade City.

The government will pay $2.17 a gallon for the concentrate, which is to be distributed to school students in all parts of the country under the federal school lunch program.

HANDLE GENTLY PLEASE

The stewardess doesn't seem to mind although she is being handed a package containing 72 queen bees and a supply of sugar candy. The bees are bound for Palestine.

Production Area Set By Wage Administrator

A NEW "area of Production" definition as applied to agricultural exemptions under two sections of the Fair Labor Standards Act, has been issued by the wage and hour administrator. Under Section 7 (c) of the Act, employees of a plant engaged in first processing of agricultural or horticultural commodities during seasonal operation, within the area of production, are entitled to a 14 week overtime exemption. Section 13 (a) (10) provides total exemption from both the wage and hour provisions of the Act for any worker employed within the area of production engaged in canning agricultural or horticultural commodities for market. The definition of "area of production" has changed a number of times, the last being ruled out by the Supreme Court in June, 1944.

Now, in order to come under Section 7 (c) the establishment must be located more than one airmile from any city of from 2500 to 50,000, three airline miles from any city of 50,000 to 500,000, and more than five airline miles from any city of 500,000 or greater. Also, 95 percent of the commodities processed, other than grain, soybeans, eggs or tobacco, must come from sources within a radius of 20 miles.

The same definition applies under Section 13 (a) (10) except that the source of supply must be within a radius of 15 miles.

Bottlers Name Winner Of Chesterman Award

JOHN H. BUCHANAN, of Chicago, has been named to receive the Chesterman Award for 1946, the first such award to be made by the American Bottlers of Carbonated Beverages, according to announcement by Thomas Moore, Chairman of the Committee of Awards.

The Chesterman Award program, announced in 1945 by the National association, offers a Certificate and $1,000 cash to the person or persons who, in the opinion of the Committee of Awards, make the most outstanding scientific or technical contribution to the progress and advancement of the soft drink industry during the year.

The 1946 Chesterman Award to Mr. Buchanan was made upon the basis of his latest work on beverage syrups, involved in the preparation of material on "Syrups and Syrup Making," which is used as a text in the A.B.C.B. Short Courses. As an added contribution to that industry program he has served as instructor on syrups and syrup making at A.B.C.B. Short Courses held during 1945 and 1946 at the University of Illinois, Drexel Institute of Technology, and the Agricultural and Mechanical College of Texas.

Frozen Foods Group Formed in Southeast

BOB CROSSFIELD, Crossfield Ice & Cold Storage Co., Griffin, Ga., became the first president of the Southeastern Frozen Foods Association, at its organizational meeting in Jacksonville, Fla., in December. A constitution and bylaws were also adopted by the group of 50 representatives of the industry, which named a full slate of officers and a board of directors.

The two-day program was featured by speakers drawn from the frozen food industry throughout the country. In his talk on major problems, Lawrence S. Martin, secretary-manager of the National Association of Frozen Food Packers, narrowed his discussion to two major considerations. The first problem, he said, has to do with the industry's present and future economic position. The second is to convince each and every segment of the industry that it is imperative that all frozen pack merchandise reaching the ultimate user is of the finest possible quality.

Officers elected with Mr. Crossfield were: E. H. Bain, Crozet, Va., 1st vice-president; T. J. Hicks, Cocoa, Fla., 2nd vice-president; Dixon Watson, Bateman Frozen Foods Co., Macon, Ga., secretary-treasurer. The board of directors included: I. T. Olsen, Hendersonville, N. C.; P. T. Ford, Dillon, S. C.; M. T. Fannaly, Ponchatoula, La.; Ralph H. Dulaney, Exmore, Va.; A. H. Reppard, Jr., Dade City, Fla.; and George H. Hyslop, Plant City, Fla.

Nuthin In The Middle But Was It a Doughnut

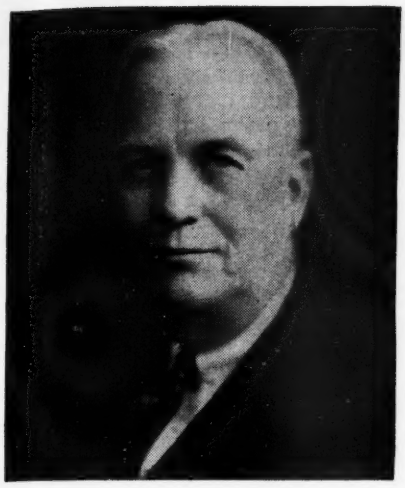
THE BOMBAY branch of the State Department's Office of Information and Cultural Affairs—formerly the USIS—is called on daily for the most recondite opinions and information about American life, but no request has given such a surprise as a "rush" call for assistance that came through last month.

An importing house phoned to ask whether it could send an American around to its office at once to give some expert opinion on a new product—nature unspecified. When the staff member arrived at the office a few minutes later he was conducted to the inner circle of a swarm of gaping, shouldering Indians. There, set up on the office floor, was a U. S. doughnut-making machine, flip-flapping away. Gravely he was handed a steaming crisp sample.

It passed his test, which was a most important one from the importer's standpoint, for although all the directions had been followed carefully no one knew whether the product was what it ought to be.

Selling price of the machines, plus recipe, is $1,500. Market is still doubtful, for the average Indian never has heard of a doughnut.

"HAND PAINTED LABELS SUITABLE FOR FRAMING ON EVERY CAN OF OUR PRODUCTS — IT'LL SWEEP THE COUNTRY!"



WILLIAM F. R. MURRIE

Retirement Planned By Hershey President

WILLIAM F. R. MURRIE told a mid-January meeting of the board of directors that he intends to retire as president of the Hershey Chocolate Corp., on March 24, at which time the stockholders meeting of the company is scheduled. Mr. Murrie said that he is now well past the age for retirement and that the state of his health, the wishes of his family and his desire to be free of further responsibility all indicate the step.

The retiring president has been with the Hershey company for over 50 years. He will continue in an advisory capacity only.

AFL Drive Aimed At Florida Citrus Labor

A STATE-WIDE organizing drive among Florida citrus workers has been started by AFL, holding out prospects of minimum wages of 75 cents an hour for common laborers and proportionally higher rates for skilled labor.

George L. Googe, Southern Director, said that a large force of organizers has been directed to Florida to organize the largest single group of workers in the South, with the exception of lumber and textiles, yet unorganized. It is estimated that there are approximately 75,000 people employed in the industry, including the canning plants and packing houses.

In addition to higher wage rates, the AFL will seek better working conditions, unemployment compensation by legislative action, and a protection to workers against citrus acid poisoning. Job security will be sought for workers of canning and packing plants and guarantee to return to work for seasonal workers.

YOU CAN PUSH MORE THAN YOU CAN CARRY

USE THE WHEEL-EZY FOR THOSE HEAVY LOADS

The strongest man can't pick up five full cases of bottles. Yet any man can easily wheel the same load up over the curb and across the sidewalk with the Wheel-Ezy Hand Truck. Carrying those cases in one at a time takes five times as long and costs five times as much. For easier handling of cases, kegs, bags and nearly all packaged goods (as well as lower cost handling) you need the Wheel-Ezy.

Wheel-Ezy carries up to 500 pounds, yet weighs only 28 to 35 pounds (depending on model). Step-climber feature makes the Wheel-Ezy climb curbs and steps with ease. Send for specifications and prices today.

Model CK-45-AGH

Model CK-145-D-GP

Models are available with single or double handles, solid plate or open nose. The combination of your choice — with wheels of Nicro Steel (NH), Resinoid (DUR), Demountable Rubber Wheels (AGH) or General Pneumatic (GP).

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The Rapids-Standard Co., Inc.

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More Meat in Prospect Says Institute Head

THE government's tentative livestock production goals will permit a per capita meat consumption of 155 lb. during 1947, according to John F. Krey, chairman of the board of the American Meat Institute, in a year-end statement. Not since 1911 have the American consumers had so much meat.

Estimates of the Federally inspected hog slaughter during the current November-April period, Mr. Krey said, are for about 30,000,000 head, or 2 percent greater than during this period last year.

Reliable estimates indicate a per capita consumption of all meat at about 156 lb. for the first three months, 145 lb. for the following three months, 139 lb. for the third quarter and 162 lb. for the last three months of 1947.

In recent years, the statement continued, 78⅜ cents of each meat packer's sales dollar has been paid out for livestock; payrolls account for 11 cents; supplies, interest, taxes, etc. account for 5⅝ cents; operations and transportation take 3⅜ cents. This leaves a profit of 1⅝ cents, which averages only a fraction of a cent a pound.

Carryover Problems Facing Food Packers

LACK of quality control of some brands of frozen vegetables is an important factor retarding their movement to final consumption, according to the Bureau of Agricultural Economics. The 1946 pack estimated by BAE to be about 380,000,000 lb. is the largest on record. So were the cold storage holdings on December 1, 1946, when 350,000,000 lb. were reported on hand. Extra large stocks plus consumer resistance to the purchase of inferior quality are already contributing to a weakening of prices.

Growers of truck crops are being cautioned by USDA to secure definite contracts for their 1947 crop if they expect to sell to the commercial processors. Softening of the future market already noted indicates a downward price trend. As officially stated by the department, "Opportunities for making favorable diversion of production from fresh to processing outlets may not be as good in 1947, particularly after mid-year, as they were in 1946."

Significant also is the statement, "Indications are increasing that movement of canned and frozen vegetables is slowing up in distributive channels, and the carry-over stocks may be somewhat larger than has been anticipated."

Total supply of canned vegetables including the carry-over stocks, is currently estimated to amount to the equivalent of 290,000,000 cases of 24 No. 2 cans, considerably above the equivalent of 262,000,000 cases available for the 1945-46 season. The government experts believe the consumption of canned vegetables for the 1946-47 season will amount to from 45 to 47 lb. per capita. This will amount to from 1 to 3 lbs. more per capita than the year before, which was the previous high.

Production of truck crops for processing reached a new high in 1946 amounting to 6,300,000 tons according to the estimates of the Bureau of Agricultural Economics, U. S. Department of Agriculture. This was an increase of 8 percent over the previous high of 1942. Prices that the processors paid for the 1946 crop also were a new high being slightly above the prices paid in 1945.

Freight Rates

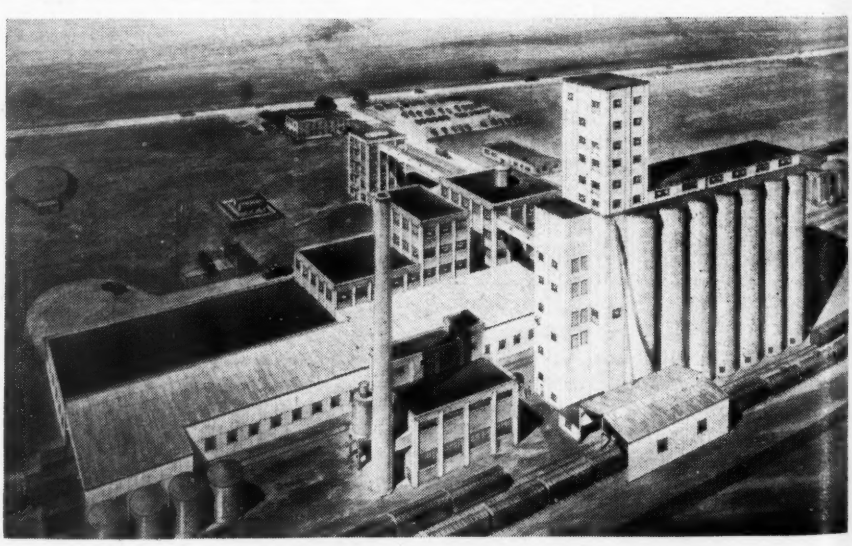
THE meat packers have filed a petition with ICC asking for a change in the recently increased freight rates. The packers believe that the 20 percent increase on packinghouse products should be modified and brought into balance with the rate increase on livestock, which amounted to only 15 percent.

Can Rationing Handed Back to Manufacturers

RATIONING of tin cans has been shifted from the shoulders of government to the can manufacturers in one of the first moves preparatory to the final abandonment of wartime controls. The amendment of the "tin can order" M-81, lifting restrictions on the use of tin cans, gives the packers of coffee, beer, pet foods and other food items, which could not be put up in tin during the war, the right to use tin containers again. Quota restrictions on the use of tin cans for packing some non-food items such as paint, turpentine, polishes, liquid soap, roofing cement and the like were also lifted. But the amendment does not guarantee that the cans will be available.

The amount of pig tin allocated for the manufacture of tin plate has not been changed. This means that the number of tin cans that will be manufactured will remain approximately the same. Actually, the supply of strip steel continues to be a bottleneck. In spite of the fact that tin has been in short supply throughout the war, there has always been enough made available to plate all the strip steel that could be rolled. No change in this condition is yet in sight.

Can users must now grapple with the problem of short supply sans government control, with only the shriek and scream method of appeal. However, the pattern of distribution is not expected to change. Food packers will be served first just as they always have been. Actually it would be a blessing for some segments of the industry if they could not get as many caps as they think



PROTEIN FRACTIONATION PLANT

The Borden Co. is constructing this $1,750,000 plant at Kankakee, Ill., to fractionate protein products. Located in the heart of the Illinois soybean area, the company will utilize the results of their research on food and feed from soybeans.

WHAT IS A COLLOID MILL?

A colloid mill is a precision machine, capable of effecting in a confined clearance an intense shearing action on the particles and the particle structure of a processed mass, whether the particles be liquid, semi-solid or solid. This intense shearing action generated between the faces of a moving rotor and fixed stator reduces the particle size to the "colloidal range" of a few microns down to invisibility under the ordinary microscope and coincidental with this reduction in particle size, further produces a combination of forces within the mass which bring about the phenomena of dispersing, wetting, emulsifying and homogenizing.

The Premier Colloid Mill is a gravity-fed vertical mill that can be adjusted to any degree of clearance between rotor and stator. It may be run at high or low speeds.

What will it do in my plant?

It will emulsify and homogenize. It will disperse and disintegrate and grind. It will mix products evenly and uniformly. And, if the mill you use is a Premier, you can expect it to improve your product's quality, increasing its fineness and giving it stability. You can expect this while costs are being lowered and processing efficiency raised.

Where can I find out more?

By asking for information from Premier Mill Corporation. The more you tell about your dispersion problems, the more complete and helpful the reply will be.

PREMIER CLIP COUPON FOR MORE DATA

COLLOID MILLS

PREMIER MILL CORP.
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SEND DESCRIPTIVE CATALOG

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they need. For example, the citrus juice packers, who are afraid of the size of their carryover in the face of the largest citrus crop in history, might be benefited.

Remaining are the provisions of Order M-81, which specify the thickness of tin coatings and regulate the sizes of tin containers.

Tin imports for the first nine months of 1946 amounted to 38,512 tons, according to CPA. This compares with 32,022 tons during the same period in 1945. Bolivia continued its wartime position as the principle source of supply. Imports from the Far East during this period were 2,474 tons, about 5 percent of the prewar average.

Editorials Condemn Co-op Butter Rigging

THE NATIONAL TAX EQUITY ASSOCIATION is distributing three editorials condemning the recent market rigging activities of the tax free Dairymen's League. The gist of the three editorials, one each from the St. Louis Post-Dispatch, The Chicago Tribune and the Washington Post, is that if a cooperative acts in restraint of trade it should be subject to regular taxes as well as to the anti-trust laws.

The Dairymen's League, a cooperative made up of some 26,000 farmers serving milk in the New York area, admitted buying large quantities of butter during December, in order to sustain the price of fluid milk past the deadline for setting milk and butter prices for January. December 24 was the deadline. The league stopped buying on that date and the butter price immediately hit the toboggan.

Large Soy Flour Sales Made by A. E. Staley

SALE of 2,900,000 lb. of soy flour to the British Ministry of Foods has been announced by A. E. Staley Manufacturing Co. of Decatur, Ill. The full fat grade of soy flour being shipped contains 20 to 22 percent oil fat.

During World War II, Staley's sold soy flour to UNRRA for distribution throughout Europe after having made, in the earlier days of the war, extensive shipments of Lend-Lease soy flour to Great Britian and Russia.

China, Greece, Italy, Poland, Austria, Jugoslavia and Czechoslovakia were the principal recipients of soy flour from UNRRA during the first nine months of 1946, when UNRRA shipped 170,000,000 lb. of it from the U. S. Data on shipments during

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LUBRIPLATE
Lubricants definitely reduce friction and wear to a minimum. They lower power costs and prolong the life of equipment to an infinitely greater degree. LUBRIPLATE arrests progressive wear.

LUBRIPLATE
Lubricants protect machine parts against the destructive action of rust and corrosion. This feature alone puts LUBRIPLATE far out in front of conventional lubricants.

LUBRIPLATE
Lubricants are extremely economical for reason that they possess very long life and "stay-put" properties. A little LUBRIPLATE goes a long way.

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DEALERS FROM COAST TO COAST
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Press Association

JUST ANOTHER BIRTHDAY

Here is a cake that is a cake. It is a small scale model of the Illinois State Capitol. Henry Wagner, of Chicago's Stevens Hotel, is showing his handiwork to Gov. Dwight Green, for whose 50th birthday it was baked, while Mrs. Green looks on.

the last three months of the life of UNRRA are not yet available.

Russia has not obtained any soy flour from the U. S. since the war ended, apparently getting her supply from Manchuria, most of which she occupied until recently. Several European countries in the non-Russian sphere of influence recently received shipments of soybeans, presumably from Manchuria.

Considerable shipments of soy flour were made to Germany during the past year by the Department of Agriculture, which purchased the flour for distribution by U. S. Army occupation forces.

Freight Carloadings To Increase in 1947

FREIGHT carloadings in 1947 are expected to increase by 8.8 percent over last year, according to the forecast of the Regional Shippers Advisory Committee. The freight requirements of 32 principal commodities, as furnished to the car service division of the Association of American Railroads, will total 7,091,603 cars as compared with 6,515,810 actual carloadings in 1946.

Requirements on food commodities range from an increase of 16.2 percent for fresh fruits other than citrus, to a decrease of 2.1 percent for livestock. Car needs for canned and packaged food products are up 13 percent and for frozen fruits and vegetables 26.2 percent.

Aptitude Test Manual Published by Bottlers

COMPLETION of the American Bottlers of Carbonated Beverages manual on aptitude testing was announced by Edward Wagner, chairman of the association's plant operation committee, following the meeting of that group in Washington recently.

The manual was prepared for the A.B.C.B. by Benge Associates, Chicago management engineering firm, after several months of surveying and studying employment procedures and employee requirements of the industry. Procedures recommended in the manual were exhaustively tested in several plants visited during the course of the survey so that it is believed they will contribute to more effective employment practices in the industry.

The new manual is now being printed and will be available to A.B.C.B. members in the very near future.

As an added means of bringing the benefits of the association's job evaluation and aptitude testing programs to A.B.C.B. members, the plant operation committee also is planning a program of management conferences on employment procedures. Preliminary arrangements have been made for the direction by Benge Associates of such conferences, at which the procedures of job evaluation and aptitude testing will be explained and demonstrated with the A.B.C.B. manuals.

It is planned that conferences of this nature will be held in several areas, with the first groups meeting in Chicago, Cincinnati, Atlanta, Birmingham, and Nashville. Each conference will be a two-day session, and attendance will be restricted to representatives of member plants. To assure best results it also may be necessary to limit each group to fifty persons.

Ease Suspension Order On Molasses Company

THE USDA recently modified a suspension order entered against the Allied Molasses Co., Inc., Perth Amboy, N. J., on August 16, 1946, which has prevented that company from accepting delivery of blackstrap molasses or any other such molasses since that time. The suspension was imposed for failure on the part of Allied Molasses Co., Inc. to comply with WFO 51.

Under the modification of the suspension order, Allied may accept the delivery of blackstrap molasses in an amount equal to one-half of its yearly quota—or 191,400 gal. during each marketing year—until the accumulations from the withheld one-half shall equal the company's past over-use of 504,193 gallons.

Overcoming Tieups In German Food Shipments

LIEUT. GEN. LUCIUS D. CLAY, deputy U. S. military governor for Germany, was assured, during his recent visit to Washington, that the War Department is making headway in breaking the food transportation bottlenecks which, to date, have threatened to wreck the occupation program. Secretary Robert P. Patterson told General Clay that the reasons for the critical food situation in Germany are threefold: The recent shipping strike which set back the program 60 days; the continuing shortage of box cars and the added tonnage which must now be sent to the British zone, under the new British-American agreement.

General Clay said that the present German ration was down to 1,550 calories per day, which is well below the minimum deemed necessary to support a working population. Even this low ration can be maintained only if the food is provided from America and if trans-

portation is made available to move it to and from the ports. The general warned that if this ration again has to be lowered our efforts to build a self-sustaining economy in Germany cannot succeed, and the reeducation of German people to a peaceful, democratic philosophy becomes a hopeless task.

Court Reverses OPA On Deaf Smith Flour

THE UNITED STATES EMERGENCY COURT OF APPEALS recently ruled that Vitamin Products Co., Milwaukee, had not violated OPA ceilings in selling Deaf Smith flour at higher than the prices established for ordinary whole wheat flour. The court based its ruling on the opinion that Deaf Smith flour is more costly to produce, is recognized by many physicians as beneficial in prescribed cases of malnutrition and has always sold at prices higher than ordinary whole wheat flour.

The court declared that the OPA administrator had exceeded his authority in classifying this flour as unnecessary to certain diets and in denying the flour to those who desired it, since it could not be produced at the regular ceiling.

OPA Rations Offices For Sugar Functions

CONTRACTING operations of OPA will cause eight sugar branch offices to be closed during the first half of February. Matters pertaining to sugar rationing will be transferred to nearby offices to which requests for trade information, inquiries, application forms and reports should be directed. These are as follows:

Albany, N. Y. and Buffalo, N. Y. to Syracuse, N. Y.; Scranton, Pa. to Philadelphia, Pa.; Washington, D. C. and Wilmington, Del. to Baltimore, Md.; Nashville, Tenn. to Memphis, Tenn.; Fort Worth, Tex. to Dallas, Tex.; Jacksonville, Fla. to Miami, Fla.

Cocoa Trade Freed

ALL import restrictions on cocoa beans, cocoa butter, and unsweetened cocoa powder were removed effective January 7. Import licenses which have been required since 1942 will no longer be necessary. But international allocation on a worldwide basis is expected to continue under International Emergency Food Council because world cocoa supplies in general remain substantially below demand.

WANTED: YOUR SPRAY PROBLEMS!

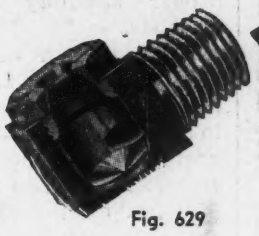

Fig. 629

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Wax Fruits?
Rinse Vegetables?
Powder Milk?
Dry Eggs?
Wash Filter Cake?
Humidify Banana Rooms?

Monarch Spray Nozzles are doing these and innumerable other Food Processing jobs. If your liquid can be sprayed with direct pressure Monarch can supply the nozzles.

Outline your problem so that we may make recommendations.

Send for Catalogs 6-A and 6-C

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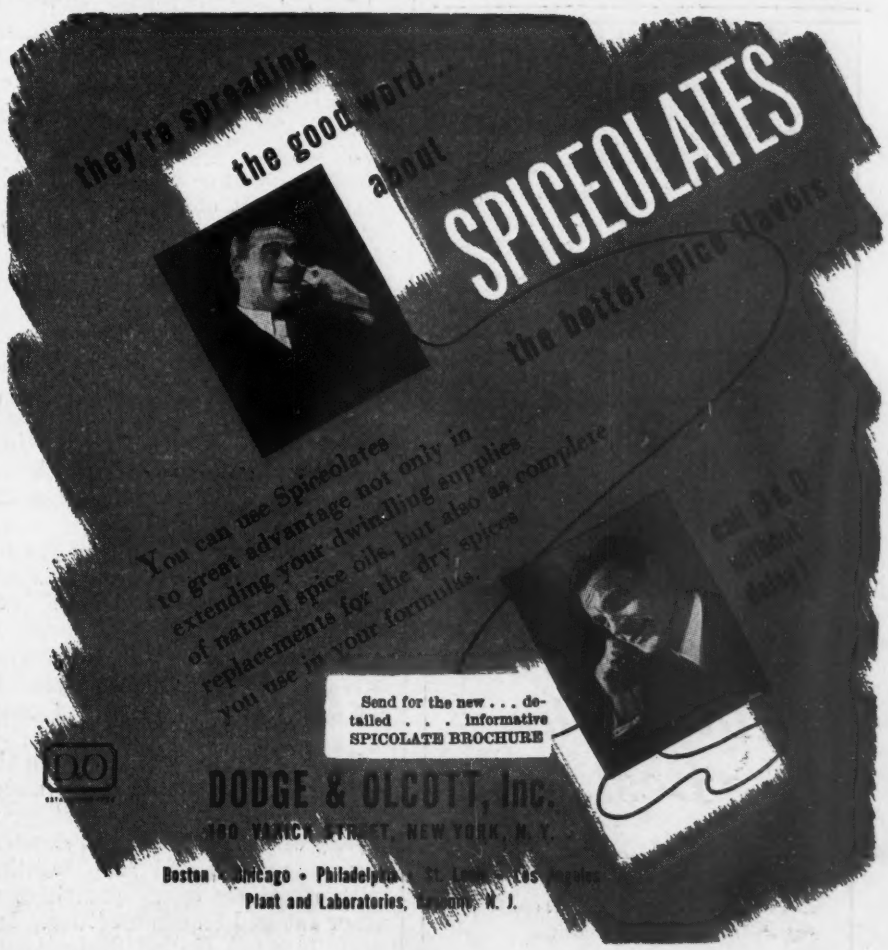
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the better spice flavors
You can use Spiceolates to great advantage not only in extending your dwindling supplies of natural spice oils, but also as complete replacements for the dry spices you use in your formulas.
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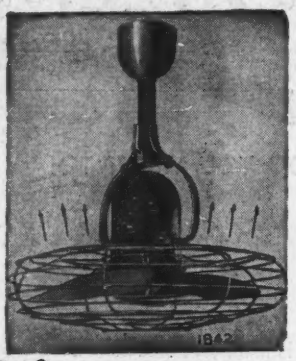
THE FAN WHICH KEEPS EMPLOYES WARM



Reco RADI-AIRE

HEAT CIRCULATOR

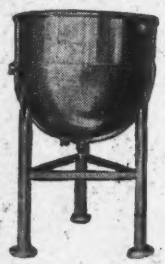
Because it blows upwards, the RECO drives down the hot air which, in the winter, is always trapped at the ceiling. It intermixes the hot ceiling air with all of the air in the room, raising the temperature and humidity at body level and eliminating cold floors. It dissipates smoke and odors and reduces operating costs.

Please write for Bulletin 221A giving complete information.

REYNOLDS ELECTRIC COMPANY

Mfrs. of Refrigerator Fans, Fly Chaser Fans, Air Circulators, Food Mixers and Vegetable Peelers.

2668 W. Congress Street, Chicago 12, Illinois



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You Don't Have The Best.

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Bombay Milk Program Undergoing Expansion

THE BOMBAY PROVINCIAL government plans to spend $15,000,000 in the next five years as part of a program to centralize Bombay City's milk supply system and insure proper handling and processing methods.

Aiming at a reasonably priced daily supply of 1,700,000 lbs. of milk, the new plan is the successor to a subsidized milk production program on which the Provincial government had been spending nearly $4,000,000 annually on behalf of about 350,000 lower class children and nursing mothers.

It calls for establishment of dairy colonies in the country outside of Bombay at which up to 1,200 milch-buffaloes (India's milk producers) can be kept. Facilities at these centers will be rented out to cattle owners, or groups of cattle owners, who agree to maintain certain handling and sanitary standards.

Result of the program may be the gradual decay of Bombay's present private milk-supply practice, under which a comparative handful of first-class dairies barely scratch the surface of demand while thousands of upper-middle and upper-class families maintain their own dairy cattle in the suburbs in private or public stables.

Meat Supply

TOBIN PACKING CO., INC. and Maxson Food Systems, Inc. recently concluded an agreement whereby Tobin will supply the beef, lamb and veal components for Maxson's frozen complete meals. The arrangement, according to the two companies, will make possible substantial economies through the elimination of several intermediate steps in distribution.

The meat will be supplied from the Albany division of the Tobin company.

Import Control

DRY skim milk, dry whole milk, evaporated milk (unsweetened), cheese, lentils, and chickpeas (garbanzos) have been removed from the import control provisions of WFO 63. This action became effective January 6, with issuance of amendment 63.19 to the order.

These products were put under import control as a wartime emergency measure in 1942.

RAW MATERIALS REVIEW

Fats and Oils Return To Net Import Basis

THE UNITED STATES expects to schedule for import approximately 240,000,000 lb. of fats and oils and for export approximately 138,000,000 lb. during the first quarter of 1947, according to the Department of Agriculture. This is on the basis of the International Emergency Food Council recommendations for the international distribution of fats and oils during the first quarter of 1947. This is the first time since 1942 that the U. S. will be on a net import rather than a net export basis.

No recommendations for the international distribution of fats and oils during later quarters of 1947 were made by IEFC although it announced its intention to promulgate such recommendations prior to the beginning of the second quarter.

Exports of fats and oils from the United States contemplated under this program would consist principally of lard, soybean oil, shortening, margarine and soap together with relatively small quantities of other fat and oil commodities. Imports into the United States would consist principally of copra (for crushing into coconut oil), linseed oil, castor beans and oil and smaller quantities of tung, rapeseed and other oils.

New India Tea Quotas Break British Block

LAST month (January) has seen broken two more threads that bind the Indian areas to the wheel of British control—the revocation of wartime controls that gave the Ministry of Food sole purchase rights to Indian and Ceylonese tea.

The Indian government has announced that, effective January 1, the "tea block purchase scheme" becomes ineffective and private exports are permissible. Government still retains its export licensing powers however, and producers must apply for quotas.

Although these quotas have not yet been made public it is certain that they will show a movement away from the British market. India still needs foreign exchange from so-called "hard currency" areas, and with sterling—of which she has plenty—still tied up within the dollar pool and unconvertible except in relatively small amounts, her

There's no longer any need for women to be victims of the "onion in the eye" school of cooking . . . not with Ivanhoe Teaspoon Onions handy on the pantry shelf. No more tears . . . no more scented hands . . . no more kitchen odors . . . just genuine onion flavor.

Crown Screw Caps, attractively lithographed in three colors, have been selected by the manufacturers, Ivanhoe Foods, Inc., of Auburn, N. Y., as a closure for this product. Perfect, bright-finish tinplating, patented sealing ring material and exclusive Deep Hook Thread construction give Crown Screw Caps exceptional sealing qualities. Crown Cork & Seal Co., Baltimore 3, Md.

World's Largest Makers of Metal Closures.

CROWN CLOSURES

New! 20-Mill Plastic

Basco-TEX

PLASTIC APRONS!

Will Not Crack or Peel

POSITIVE PROTECTION against WATER, OIL, ACIDS, ALKALIES

NO LAUNDERING *Just wipe off with a damp cloth. A tremendous cost saver.*

20 MILL PLASTIC
10 Times Stronger than Cloth
Cost only about **1** *cent a day*

PRICES—COLORS—SIZES

WHITE— 4 Mill Plastic

27 x 36..$ 6.62 per doz.
30 x 36.. 7.53 per doz.
36 x 40.. 7.96 per doz.
36 x 44.. 8.85 per doz.
Full Length Sleeves $6.00 per doz. pair

BLACK or WHITE— 8 Mill Plastic

27 x 36..$ 9.00 per doz.
30 x 36.. 9.75 per doz.
36 x 40.. 11.15 per doz.
36 x 44.. 13.65 per doz.
Full Length Sleeves $10.65 per doz. pair
Leggins, Hip Length $13.10 per doz. pair

MAROON — Heavy Double Coated Neoprene

27 x 36..$12.50 per doz.
30 x 36.. 14.00 per doz.
36 x 40.. 18.35 per doz.
36 x 44.. 20.50 per doz.
Full Length Sleeves $12.90 per doz pair
Leggings, Hip Length $23.50 per doz. pair

BLACK— 12 Mill Plastic

27 x 36..$10.25 per doz.
30 x 36.. 11.15 per doz.
36 x 40.. 14.25 per doz.
36 x 44.. 15.80 per doz.

BLACK — Heavy Double Coated Neoprene

27 x 36..$12.90 per doz.
30 x 36.. 14.00 per doz.
36 x 40.. 18.33 per doz.
36 x 44.. 20.50 per doz.
Full Length Sleeves $12.90 per doz. pair
Leggings, Hip Length $23.50 per doz. pair

BLACK or WHITE— Extra Heavy 20 Mill Plastic

27 x 36..$14.20 per doz.
30 x 36.. 15.50 per doz.
30 x 40.. 20.15 per doz.
36 x 45.. 22 60 per doz.
Full Length Sleeves $14.25 per doz. pair
Leggings, Hip Length $25.75 per doz. pair

ALL PRICES F.O.B. Chicago.
Minimum order 1 dozen.
ORDER BY MAIL OR PHONE TODAY
Free Sample Swatch on Request

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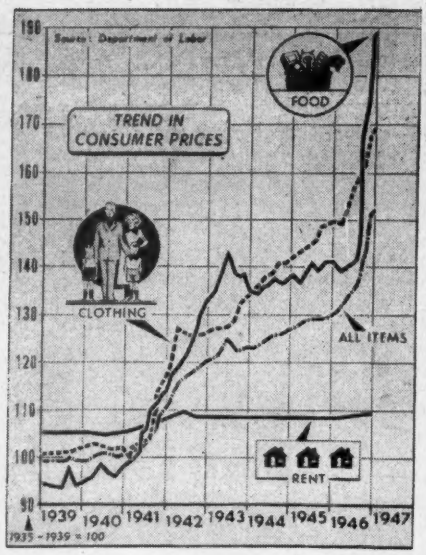


Press Association

PRICE TRENDS

Consumers, particularly those who belong to the food industry, need not be told about past price trends, but with agreement general that the food price peak has been reached, it is interesting to note how far off course food prices have gone.

tea exports (more than $72,000,000 in 1939-40) look like a good medium for obtaining it.

Prospects are, too, that with direct sales to consumer countries replacing the British middleman system, the producer's return will be greater. This is reflected in a sudden spurt in tea shares on Indian exchanges.

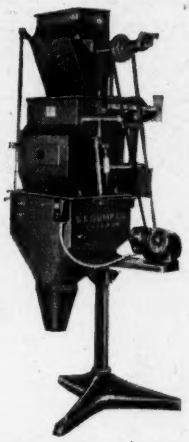
Meanwhile, similar action has been taken by the government of Ceylon. It has decided to discontinue bulk purchase arrangements with Britain—although the Food Ministry sought a contract for 1947-50—and to restore the old system of auctions and allow private exports. The auctions, accordingly, were expected to start about mid-January in Colombo.

Since Ceylon's position with regard to the Empire is quite different from India's, and her foreign exchange needs are not nearly as great, there is every likelihood that most of her crop will pass into the hands of British dealers. But a more-or-less free market, subject to export quota control, has been reestablished.

Winter Wheat

CROP prospects for winter wheat remain the best in history for this time of year, according to reliable advice from the wheat belt. The areas planted to this crop have been well covered with snow for some time and were not affected by the low temperatures during December and early January.

Can You Afford Overweights ? ? ?



Nos. A-3 and A-4 Power Feed

Edtbauer - Duplex Net Weighers May Mean Material Savings

INVESTIGATE the savings possible when package overweights are minimized with Edtbauer-Duplex Automatic Net Weighers. Accuracies of ± 1/10 of 1% are possible with many types of dry, powdered, or granular materials.

A variety of standard weigher models and sizes are available. Let us recommend the proper Edtbauer-Duplex Weigher for your application.

Gump Engineers, backed by 75 year's experience in the field of processing dry, flaked, granular, and powdered materials, will be glad to work with you in selecting the Gump-built equipment best suited to your specific requirements.

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MAKERS OF: *Equipment for Grinding, Sifting, Mixing, Feeding, Packing, and Weighing of Dry Food Products.*

WALWORTH LUBRICATED PLUG VALVES

offer these advantages

- . . . Direct port opening
- . . Quarter turn opens or closes valve
- . . . Dead tight shut-off
- . . . Freedom from attack by fluids being handled
- . . . Pressure sealed
- . . Made in a complete line. Sizes from ½" to 24" for pressures from 175 to 5,000 psi., and for vacuum requirements

THESE are just a few of the reasons why Walworth Lubricated Plug Valves give "top" performance on many *difficult* services.

All Walworth Lubricated Plug Valves employ special insoluble lubricants which protect the plug and body against contact with the line fluid, thus combatting erosion and corrosion.

The lapped surfaces of the valve are "pressure sealed" when the valve is in either the open or closed position. By turning the lubricant screw, lubricant is forced under high pressure through a grooving system that completely encircles the ports as well as the top and bottom of the plug.

The lubricant seals the valve against leakage, and reduces friction between plug and body. This permits easy, quick, full-opening, or tight shut-off with only a quarter turn of the plug.

Number 1700 (illustrated) is a Steel-iron valve, wrench operated, designed for a working pressure of 200 pounds WOG (water, oil, or gas). Valves are available in either screwed or flange types. Screwed type have API line pipe thread lengths. Flanged type (No. 1700F) is faced and drilled to American Standard for 125-pound cast iron flanges unless otherwise specified.

For further information about No. 1700 as well as the complete line of Walworth Lubricated Plug Valves, write for catalog.

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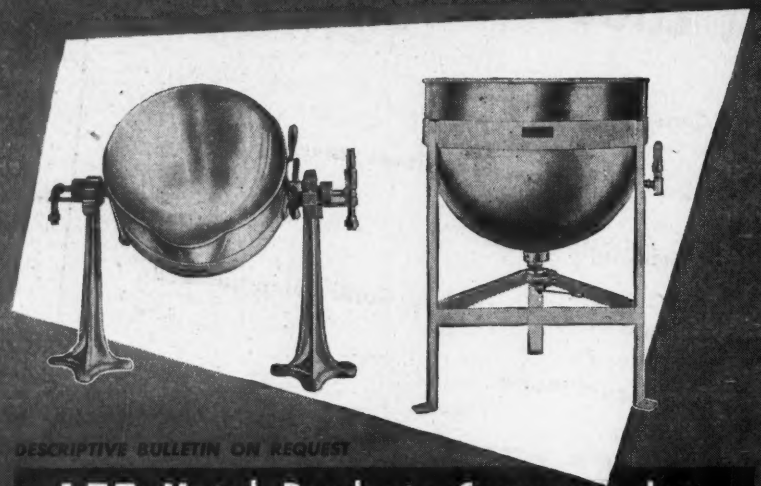

DESCRIPTIVE BULLETIN ON REQUEST

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All Lee Kettles are made to A.S.M.E. Code

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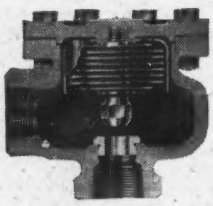
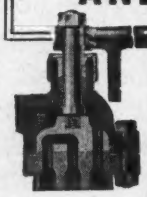


PROMOTE ECONOMY AND EFFICIENCY



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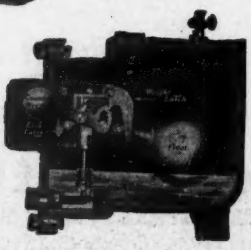
SEE OUR CATALOG IN SWEET'S



By providing a *single* source of technical information on units with such varied applications as traps, floats and control valves, your Nicholson service engineer can save you time in solving specification and maintenance problems. His ability to furnish a standard or special unit for every process and power purpose solves supply problems. Should you not know your Nicholson service engineer let us name him. W. H. NICHOLSON & CO., 193 Oregon St., Wilkes-Barre, Pa.

Sugar, Milk Products Decline in Australia

AUSTRALIAN sugar production for this season has dropped by 123,000 tons to 537,000 tons, because of dry conditions over seven months. This is ample for Australia, but the reduction will be felt by UNRRA, and other overseas outlets. The export quota has been set at 98,000 tons.

The Canadian government, for the first time in many years, is inquiring into the purchase of Australian butter to counterbalance local deficiencies during the winter months.

The number of dairy cattle in Australia dropped by 392,000, or 7.8 percent, in the three years to March 31, 1946. The number of dairy calves showed an alarming drop of from 835,201 to 611,326 in the same period. A further decline in dairy cattle herds is therefore to be expected.

While civilian consumption of cheese in Australia rose during the war from 4.29 lb. to 7.66 lb. *per capita*, exports dropped from 54.7 percent to 36 percent of production.

Australian exports of condensed and dried milk amounted to 28,408 tons in 1945-46, compared with 8,530 tons in 1938-39. Total output of preserved milk products, according to figures compiled on a basis different from that for exports, jumped from 29,150 tons in 1938-39 to 74,833 tons in 1945-46.

India Growers Watch British Nut Supply

INDIAN agricultural interests are casting apprehensive glances at Britain's growing plans for development of her own groundnut supply in Tanganyika, Northern Rhodesia and Kenya.

The trade has long been an important part of India's economy. Britain's margarine production is based almost entirely on India's groundnuts and prewar shipments ran about 133,000 tons annually—about 17 percent of the total crop.

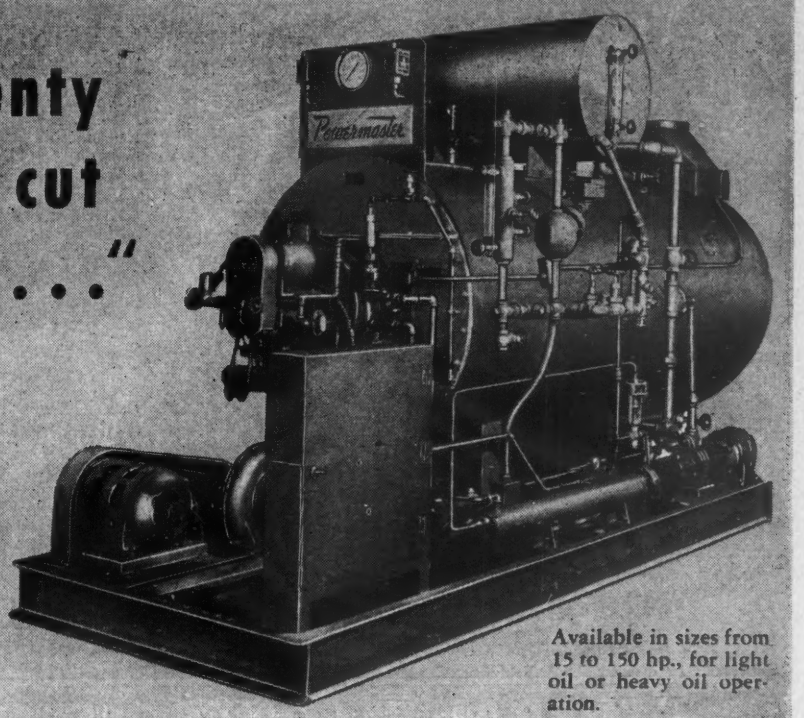
Besides facing the loss of its own export market, India is fearful that mechanized farming and exploitation of African native labor may in time create a crop that will rival hers in world markets.

Vanilla Dividend Paid

THE PUERTO RICAN VANILLA PRODUCERS COOPERATIVE has sold to a Philadelphia firm its 1946 production. The Co-op has recently distributed a dividend of $31,000 to its membership as the profit from this 1946 business.

"Now we get plenty of steam -- and cut fuel costs 67% . . ."

—reports Hockessin Food Products Company of Delaware. "Our 50 hp. Powermaster supplies all our steam needs for our kettles, retorts and hot water," says Mr. Buonamici, co-owner, "and reduced maintenance costs, too."



Available in sizes from 15 to 150 hp., for light oil or heavy oil operation.

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THE FULLY AUTOMATIC "PACKAGED" STEAM GENERATOR

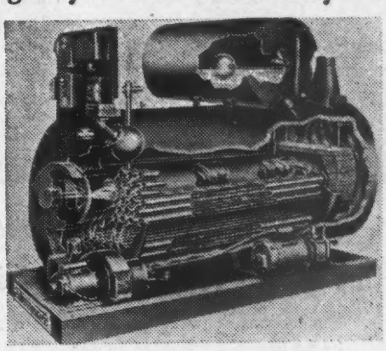
DESIGNED by Orr & Sembower engineers for the clean, speedy, low-cost operation demanded by food processors today.

BEING FULLY AUTOMATIC, the Powermaster eliminates constant attention. A flick of the switch starts and stops the unit as desired. You get all the steam you need in a matter of minutes from a cold start.

MOREOVER, the Powermaster's efficient arrangement of heating surface and compact design combine to save valuable space. And installation is made with practically no interruption to production, because boiler, oil-burner, condensate return system and automatic control panel are assembled on one steel base—and shipped complete from the factory.

WE URGE YOU to send for Bulletin #1214, describing the great savings a Powermaster offers you—and high efficiency backed by 62 years of boiler engineering.

EFFICIENT DESIGN—This "phantom view" shows the Powermaster's rugged construction and other advantages: its "spinning flame" which promotes complete combustion; its forced-draft operation which eliminates a costly stack, requiring only a small vent to carry off combustion gases; its built-in condensate return system which automatically feeds reclaimed hot water — reducing fuel consumption and prolonging boiler life.



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ELECTRO-MAGNETIC
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For Freon Methyl Chloride
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also Air, Water, Gas, Light Oils, etc.

PROVIDES on and off control of liquid or suction lines. Used with standard thermostats for positive control of refrigerants in either defrosting or reverse cycle systems, multiple temperature processes or with by-pass or unloading valves. Bodies are die forged and all internal parts are bronze or stainless steel.

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25-3

TIDEWATER
RED CYPRESS
Is the Answer to Any Problem of DECAY, ODOR, TASTE or ACID!

...Its Superior Qualities Make It Ideal for a Wide Range of Industrial Uses

The Indians knew it, the Spaniards knew it, the French knew it, and those of English decent of the Southeastern regions have known for 150 years the superior qualities of Tidewater Red Cypress and its resistance to decay. Along the Atlantic Coastal Plain where lie buried cypress trees that grew over 100,000 years ago in the Pleistocene Age, many of which have since been dug up, give mute evidence of the lasting qualities of cypress never equalled for its decay resistance. In more recent years industry has also learned that it licks the difficulties of odor, taste and acid. Tidewater Red Cypress has ALL the qualities you demand for many specific industrial demands.

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The Tidewater Red Cypress "The Wood Eternal"

CAN BE FURNISHED FROM ST. LOUIS STOCKS

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Up Rice Allocation For First Quarter

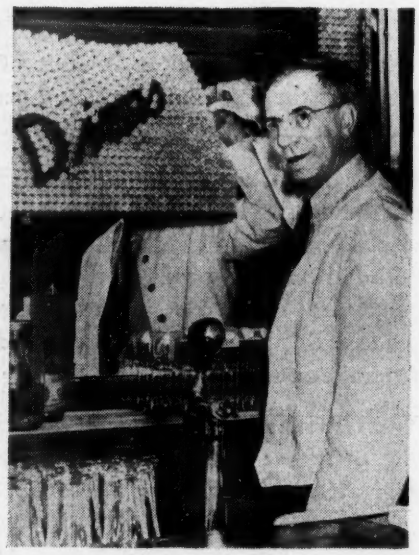
THE USDA has allocated 2,500,000 —100 lb. bags of milled rice for civilians during the first quarter of 1947. This is approximately 41 percent of the total allocable supply of 6,069,800 bags during this period. It exceeds substantially the 1,398,900 bags received by civilians during the same period of 1946.

Allocations for the first quarter of 1947 include 2,243,600 bags for commercial exports and shipments to U. S. territories; 1,137,800 bags for exports implemented by the Production and Marketing Administration (principally to the Philippines and for UNRRA), and 188,400 bags for U. S. military and war services. The exportable supplies represent a residual after providing for minimum U. S. civilian, territorial, military, and war service needs.

Flour Exports

TOTAL exports of U. S. grain and grain products during the six month July to December period were estimated by USDA at 4,584,000 long tons, 177,000,000 bu. The total Canadian flour milled in bond and exported from the U. S. in this period came to 63,000 long tons.

During December, 1,110,000 tons were exported; November, 707,000 tons, October, 373,000 tons, September, 697,000 tons, August 811,000 tons, and July, 886,000 tons.



MARCH OF DIMES

During the March of Dimes campaign to fight infantile paralysis, it is almost certain to cost you ten cents more than usual in Roy Ikerd's tavern in Seattle. Maybe it's a left hand day and you picked up your first libation with your right, or vice versa. Or maybe you said something else instead of "pshaw" or "drat it."

Artist – Fred Kabotie, native of Arizona

ARIZONA—*annual purchases: $300 million—mostly packaged.*

CONTAINER CORPORATION OF AMERICA

SAVE WASTE PAPER

Whatever the Process

- FREEZING
- CANNING
- DEHYDRATING
- PICKLING

Use LA PORTE FLEXIBLE STEEL CONVEYOR BELTING

Features that make La Porte Flexible Steel Conveyor Belting adaptable to all processing and packaging operations are: (1) its strong steel mesh construction that resists loading impacts and prevents stretching, weaving, creeping and jumping; (2) its porous structure that permits circulation of air and liquids around products in process . . . allowing drainage and facilitating cleaning and sterilization; (3) its non-corrosive metal that needs no special dressing and is not effected by steam or extreme temperatures.

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ONLY 1 MINUTE
To Make a Moisture Test with a
Steinlite

When used by an experienced operator it is "the one-minute moisture tester." It is easy for anyone to become an experienced operator for no special education or training is necessary. About all one does is (1) weigh out a sample, (2) pour it into the Steinlite hopper, (3) read a meter dial, and (4) compare the reading with a chart showing percentage of moisture.

Steinlite tests wide variety of products—dehydrated foods . . . dried eggs, nuts, cocoa, etc. There are more Steinlites in use than all other electric moisture testers combined. Precision built by a firm of radio engineers and calibrated against official oven methods. Sold on free trial basis. No money down. Write for circular.

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SEEDBURO EQUIPMENT COMPANY

PROCESSING

Regulations Approved For Process Butter

FOLLOWING a public hearing on proposed regulations pertaining to the sanitary inspection and manufacture of process or renovated butter, held November 13, 1946, the Secretary of Agriculture has approved the regulations, and they will become effective 30 days following their publication in the Federal Register.

The new regulations authorize and direct the Bureau of Dairy Industry to perform the functions and supervisory powers prescribed by the Act of Congress, approved June 24, 1946, entitled "An act to authorize the condemnation of materials which are intended for use in process or renovated butter and which are unfit for human consumption, and for other purposes" (Public Law 427, 79th Congress).

Orange Canning Plant Being Built in India

ONE of the first fairly large-scale fruit processing plants in India is slated to go into production early this year at Nagpur, in the Central Provinces, to handle a share of the $6,000,000 annual orange crop produced there.

Titled the Central Hindustan Orange & Cold Storage Co., the concern will have a cold storage plant of 1,400-ton capacity hooked up with an ice plant with a 20-ton daily output, and a modern cannery.

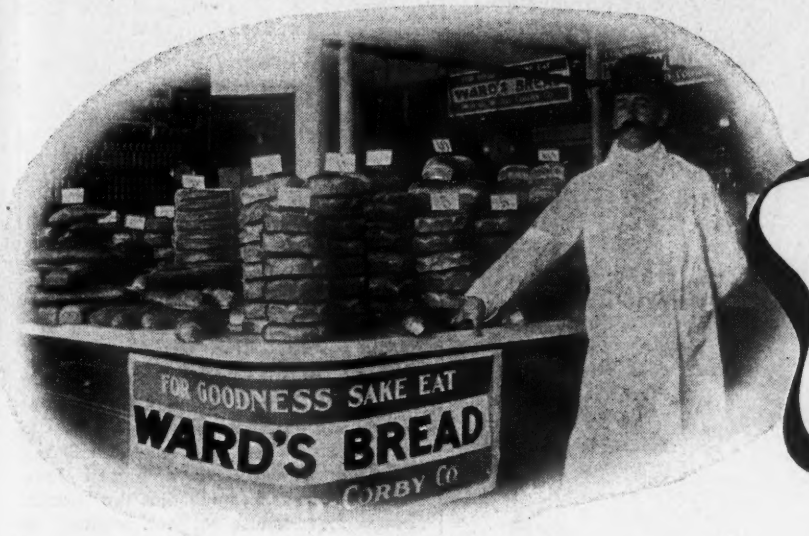
It aims at filling in on the British market which prewar took 40,000,000 cans of orange products from Japan annually.

Russians To Expand Canning in 5 Years

THE canning industry of the Soviet Union has set itself the goal of boosting production substantially in the next five years. By 1950 Soviet canneries will be turning out six times as many cans of tomatoes and nine times as many fruit preserves as in 1945.

"The Germans played havoc with the canning industry," Jan Duche, its head recently told the Russian press. "In the short period since the termination of hostilities we have succeeded in reconstructing 31 plants with a total annual output of 206 million cans, and rehabilitating 36 state farms which supply the fruits and vegetables. Another 26 plants are to be rebuilt and nine

WARD BAKING COMPANY



AT THE *Turn* OF THE CENTURY

BAKERIES first became "snow-white temples of cleanliness" when the Ward Baking Company built a radically different, modern bakery in Pittsburgh. That was 1903, the beginning of a long string of "firsts" for Ward. First, in 1908, to install a successful traveling oven in the United States . . . First in 1911, to abandon horse delivery . . . First, also in 1911, to make bread untouched by human hands from flour to dealer's counter . . . First to wrap bread on a large scale, and carry the cycle of protection from flour to home.

These are but a few of Ward's many "firsts". . . another example of the way in which American initiative and industry has brought the best there is to every American citizens' door.

WARD'S TIP-TOP BREAD

HOW WARD BAKING COMPANY USES RIEGEL FUNCTIONAL PAPERS

Ward Baking Company is one of Riegel's oldest customers in the baking field. The Tip-Top Bakers have long realized that all the baked-in goodness of their bread and cake must be carefully preserved right through to the housewife's pantry. Many Riegel Papers . . . plain or printed, waxed or coated, transparent or opaque . . . are used by the Tip-Top Bakers for appearance, economy and functional protection.

Riegel Papers

FOR FUNCTIONAL PACKAGING

(184)

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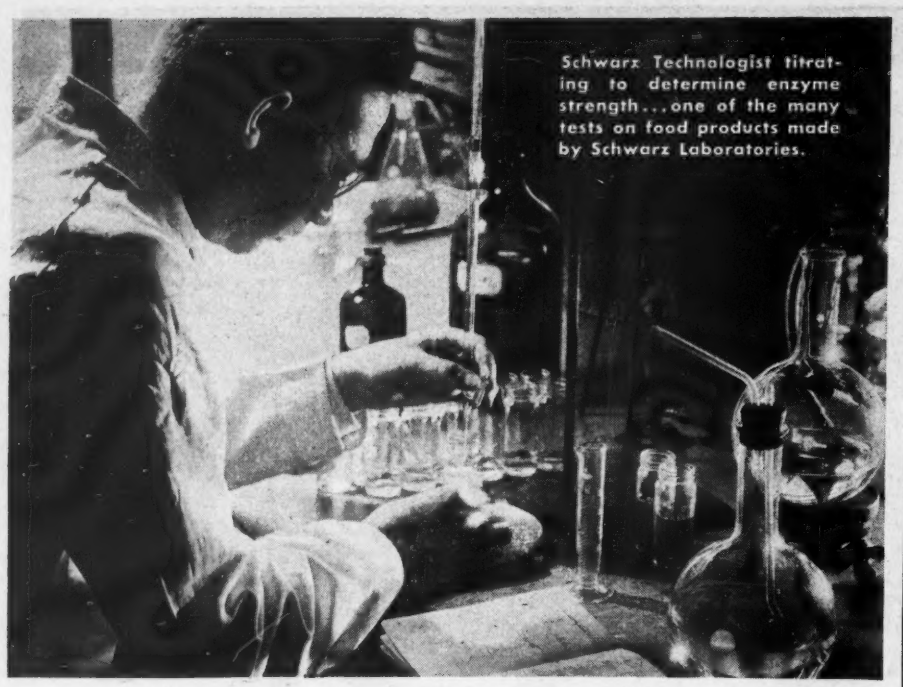

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Schwarz Laboratories, Inc. with more than 75 years of experience in serving the food and beverage industries, is particularly well qualified to help you answer questions about the nutritional "plus" values of your product. Our staff of analysts, researchers and engineers is prepared to test and analyze your product thoroughly . . . to determine its value in calories, vitamins and minerals . . . to render an impartial report on taste . . . to discover if potential value is being lost in processing . . . to recommend changes in raw material selection, processes or fortification if need be.

The complete range of services offered by Schwarz Laboratories, Inc. has assisted food and beverage plant executives in exercising control over the quality of their products for years. Why not check with Schwarz today. Our consultants will be glad to discuss individual problems with you.

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202 East 44th St., New York 17, N. Y.

WHAT, NOT AGAIN!

Yep, the citrus harvest is with us again and so are the kind of publicity pictures that editors can't conscientiously deny to their readers. This one says the Desert Grapefruit Growers have named Janis Carter because she embodies the "health, beauty and richness" of their product. As long as they keep away from the form of their product, we shall be glad to cooperate.

new ones put up by the end of the year."

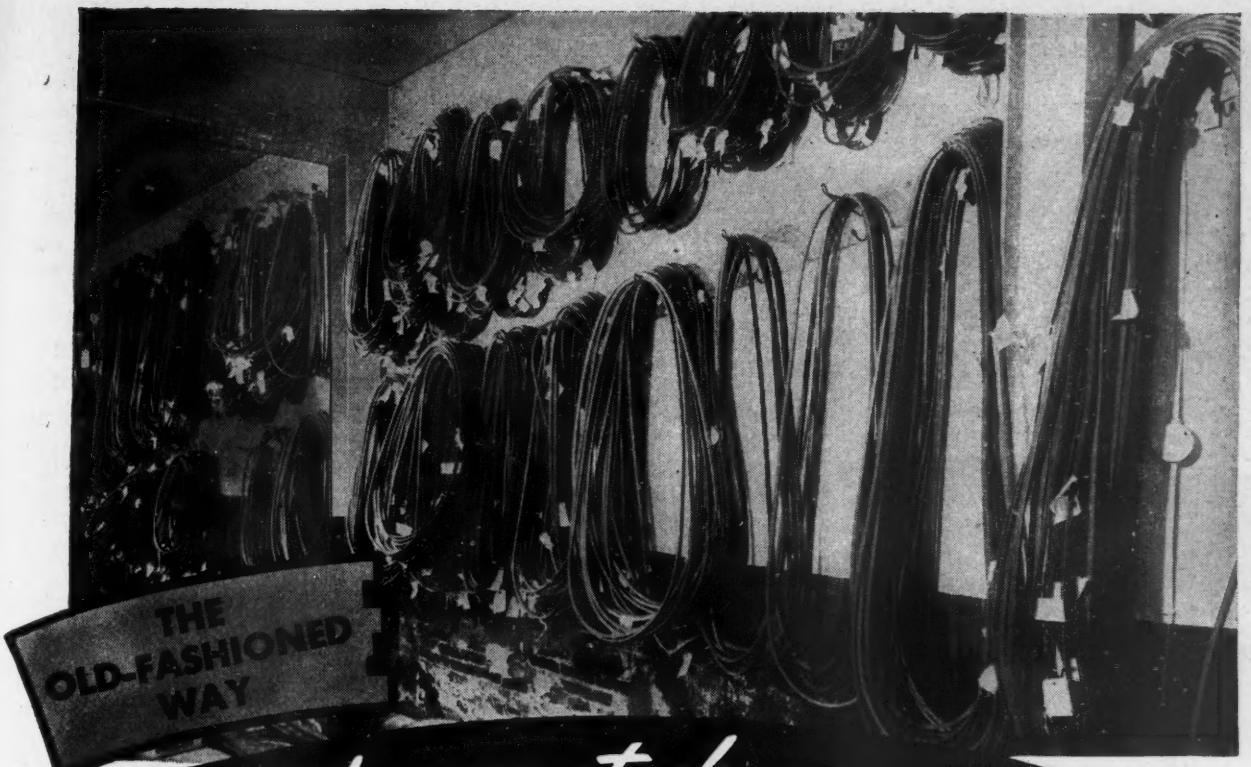
Canned Melitopol cherries, a variety of jams and glazed Crimean fruits, Kiev gherkins, strawberry jelly and grape juice produced by the Moldavian and Ukrainian conserve plants have again been made available to the consumer, Duche said. The output of jam in 1945 was two and a half times more than in 1944.

The canning industry is resuming and extending the production of special foods for children and is planning a substantial increase in the output of canned dietetic foods.

Standards Proposed For Cornmeal, Peas

ADDITIONAL alkaline ingredients may be used in the processing of canned peas, if the recent tentative order amending the definitions and standards of identity, issued by the Food and Drug Administration, is made definite. Interested persons, whose appearance was filed at the hearing last fall, had until January 17 to file exceptions to the tentative order, which was printed in the Federal Register for December 28, 1946.

Standards of identity for white and yellow corn meals and corn grits were issued in another Food and Drug tentative order in the Federal Register for January 4,



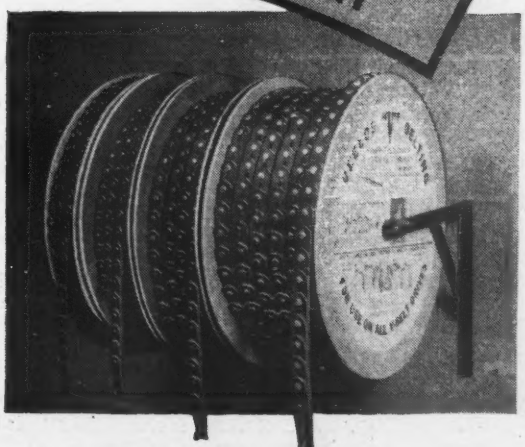
How do you stock your V-belts?

WHY stock a costly and confusing assortment of endless V-belts when you need only a few reels of Veelos, the link V-belt? With only four sizes of Veelos you can make up 316 standard sizes of endless belts. With Veelos, storing spare sets of belts for individual drives becomes outmoded. Expensive, wasteful belt inventories are eliminated . . . deterioration of spare V-belts is ended.

Veelos on reels assures a neat, orderly stockroom. Space is saved. Paper work is reduced. Any desired length of V-belt is always available. Veelos is made in all standard widths, fits all standard grooves, is packaged on standard 100-foot reels.

Veelos sales engineers are located in all principal cities; over 300 distributors throughout the country.

THE MODERN WAY



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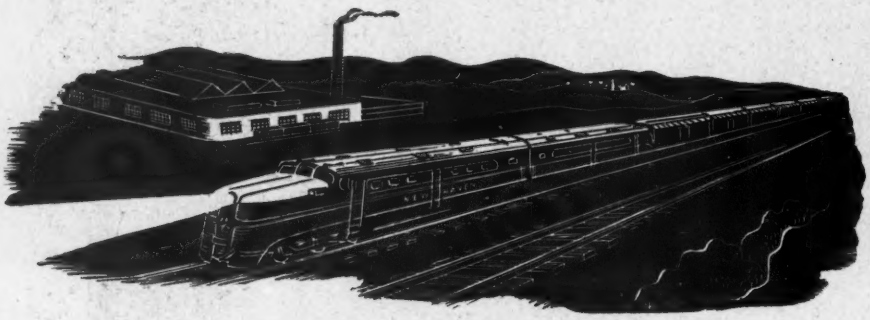

20,000,000 people are served by overnight freight service from New Haven Railroad Territory.

Coordinated railroad and highway freight service in Connecticut, Rhode Island and Massachusetts is second to none in America. *One-third* of the Nation may be reached by overnight railway express . . . and *more than half* of the Nation's population is only 24 hours by passenger train from Southern New England.

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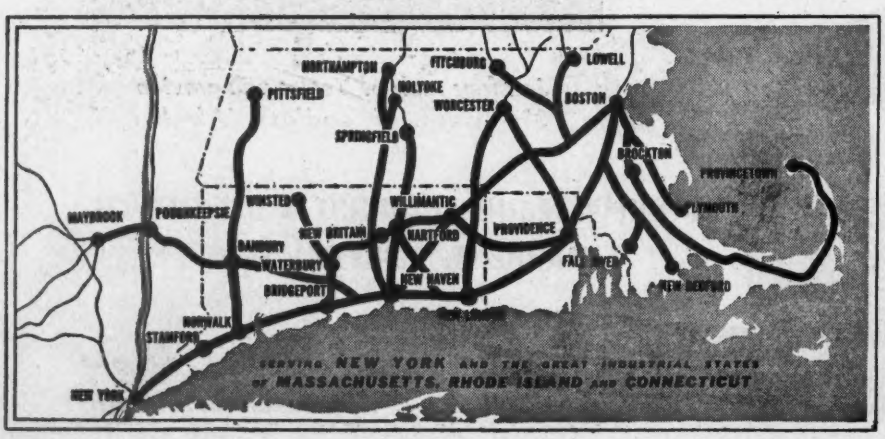
THE **NEW HAVEN** R. R.



1947. Exceptions could be filed until January 24 on any of the twelve different commodities specifically defined. Those products named were: White corn meal, yellow corn meal, bolted white and yellow corn meals, degerminated white and yellow corn meals, white and yellow corn flours, white and yellow grits (hominy grits), and enriched corn meals and grits.

Propose New Standards And Amend Some Others

PRODUCTION and Marketing Administration of the Department of Agriculture has been active in their program of amending existing grade standards and proposing new ones. Recent actions of the department include the following:

Citrus fruit grades were amended to include a new specification of "U. S. Combination Grade." This amendment was published in the Federal Register on January 1, and the effective date was January 2.

Canned tangerine juice was the subject of new U. S. grade standards proposed to become effective January 15. Publication of the proposed grades was also in the Federal Register on January 1.

New U. S. Standards for fresh bunched shallots were promulgated in the December 13 Federal Register, effective on December 16.

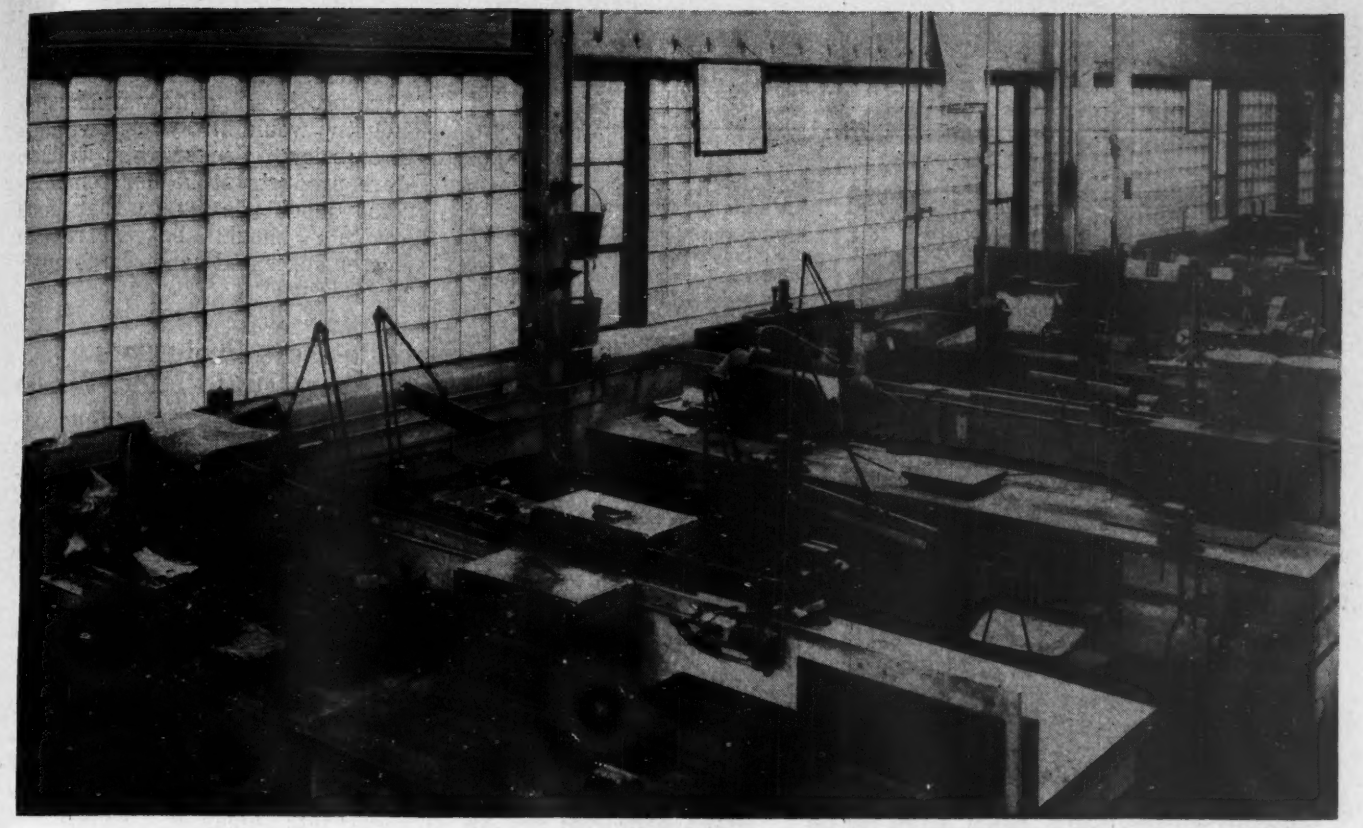
Fresh spinach leaves were the subject of another proposed U. S. standard, published in the Federal Register on December 27, to be effective on and after the day of publication.

Bacteriologists Elect

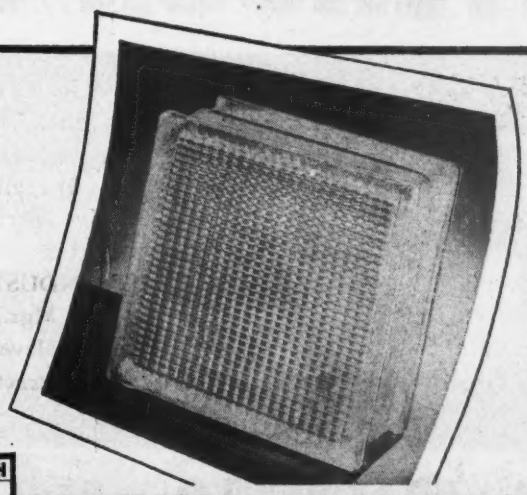
THE AMERICAN SOCIETY OF BACTERIOLOGISTS have elected Thomas Francis, Jr., University of Michigan, as their president for the coming year. Other officers named are: H. J. Conn, New York State Agricultural Experiment Station, vice-president; L. W. Parr, George Washington University, secretary-treasurer; P. R. Edwards, Kentucky Agricultural Experiment Station and L. S. McClung, Indiana University, councilors-at-large.

Freezing Nomenclature

THE NATIONAL ASSN. OF FROZEN FOOD PACKERS met recently with representatives of the National Assn. of Refrigerated Warehouses and The Refrigerations Research Foundation to discuss nomenclature for storage temperatures. Representatives of the Warehousing Association agreed that packers should designate zero storage for



How PC GLASS BLOCKS pay for themselves



SATISFIED users report that the lighting, insulating and protective properties of PC Glass Blocks cut operating costs.

PC Glass Blocks of the proper pattern distribute floods of diffused daylight, even to remote areas. That means more profitable production from the same amount of space. And you pay less for artificial lighting.

PC Glass Blocks reduce heat losses, hence reduce fuel costs. The solid panels prevent infiltration of destructive grit. The smooth glass surfaces can be quickly and easily cleaned—inside and outside—by one man with a wet brush, so you save additional money on maintenance.

These savings on operating costs are some of the ways PC Glass Blocks pay for themselves. In addition, they prevent damage to precision machines and goods in process, promote the comfort of workers, hence help to turn out better work—and more of it.

The many and varied uses of PC Glass Blocks are fully described and illustrated in our recently published book. We shall be glad to send you a free copy upon request. Pittsburgh Corning Corporation, 632 Duquesne Way, Pittsburgh 22, Pennsylvania.

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PITTSBURGH PLATE GLASS COMPANY *and by W. P. Fuller & Co. on the Pacific Coast*

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Ryerson stocks include low carbon, cold drawn, seamless mechanical tubing, both regular and pump cylinder finish, and high carbon tubing, all in a wide range of sizes. Seamless and electric welded boiler tubes, and Allegheny Stainless tubing and pipe are also on hand. Drawing on these diversified stocks will save money because close Ryerson quality control assures tubular products that meet exacting requirements of analysis, size and finish. For all tubing requirements phone, wire or write the nearest Ryerson plant.

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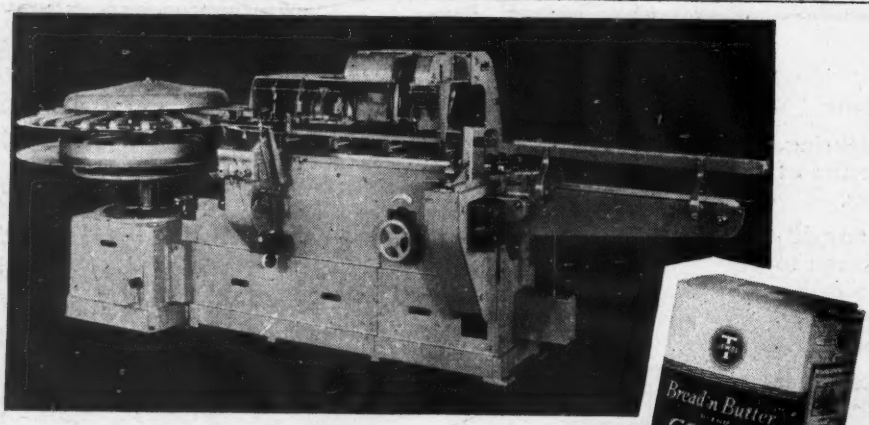
RYERSON STEEL



The SEALTITE Bag Sealer

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● Consolidated's SEALTITE Bag Sealer invariably results in important savings in packaging in paper bags. Some users report costs reduced as much as $500.00 per month per machine over previous methods of packaging.

SEALTITE handles any standard gusseted bag of 2 to 10 lbs. capacity. It settles, shapes and seals at speeds ranging from 30 to 50 bags per minute. SEALTITE produces a square, flat-topped sift-proof package that stacks like a carton. Any product usually packed in a paper bag can be packed in a SEALTITE package.

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CONSOLIDATED PACKAGING MACHINERY CORP.

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fruit, berry and vegetable products, with the understanding that in such cases the storage temperatures provided by the warehousing industry would always be zero deg. F. or below. Packers who wish to store products at higher temperatures should designate that such products should be stored in freezer space and name the temperature desired.

Ohio State Professors Score Huge Food Waste

EXISTING practices in bringing food from farm to consumer should be subjected to a "challenging re-examination" in view of the "shocking" amount of food wasted annually in this country, two Ohio State University faculty members asserted recently.

In a publication of the Ohio Agricultural Experiment Station, Professor Charles W. Hauck and W. I. Lenox of the OSU Rural Economics Department called attention to estimates that "about one-fourth of the food we produce never is converted into human nourishment but is discarded or wasted."

SCHEDULE OF EVENTS

February

2–4—American Poultry Industries, fact finding conference, Municipal Auditorium, Kansas City, Mo.
10–11—Tennessee-Kentucky Canners Association, annual meeting, Andrew Jackson Hotel, Nashville, Tenn.
11–13—University of Maryland, Tri-state Packers Association, canners' and fieldmans' school, College Park, Maryland.
18–20—Michigan State College, technical school for pickle and kraut packers, East Lansing, Mich.
20–22—Food Processors Conference, University of California, Berkeley, Calif.
23–26—Associated Retail Bakers of America, national convention, Pennsylvania Hotel, New York.

March

3–8—State College of Washington, Institute of Dairying, Pullman, Wash.
10–13—American Society of Bakery Engineers, 23rd annual meeting, Edgewater Beach Hotel, Chicago.
19–21—National Association of Frozen Food Packers, annual convention and exposition, Public Auditorium, San Francisco.
31–Apr. 4—Frozen Food Institute, annual convention, Copley-Plaza Hotel, Boston, Mass.

April

10–11—Tri-State Packers Association, spring convention, Lord Baltimore Hotel, Baltimore, Md.
8–11—American Management Association, 16th annual packaging exposition and conferences, Convention Hall, Philadelphia.
14–16—National Fisheries Institute, annual convention, Waldorf-Astoria, New York.
29–May 1—Industrial Packaging Engineers Association of America, second annual industrial packaging and materials handling exposition, Sherman Hotel, Chicago.

Changes in Food Supplies

(Indicators)

Production

Creamery butter production, in November, was estimated at 80,855,000 lb., 17 percent below October, but 18 percent above the November, 1945 output. The seasonal decline from October to November was 22 percent in 1945, though the five-year average decline between these two months is only 14 percent.

American cheese production, during November, was up in all major production areas, totaling 50,780,000 lb., 16.1 percent above November, 1945 and 14.2 percent above the five year average. The October-November decline was 16.5 percent, which compares with the five year average decline of 21 percent.

Liquid egg production totaled 10,139,000 lb., during November, compared with 2,304,000 lb. in November last year. . . . **Dried egg** production came to 2,271,000 lb., in November, as against 159,000 lb., in November 1945. . . . **Frozen egg** production, in November, totaled 2,498,000 lb., compared with 1,313,000 lb., in November, 1945.

Flour production in December, as reported by the *Northwestern Miller* and representing mills producing approximately 71 percent of the 1945 output, was 16,844,670 sacks, a decrease of 172,112 sacks from November. These mills reported 14,937,557 sacks in December, 1945.

Materials

Truck crop production for processing reached an all-time high in 1946 as is evident from the report of the National Canners Association:

Commodity	Production 1945	1946
	Tons	
Tomatoes	2,689,200	3,528,600
Green Peas	496,620	515,650
Sweet Corn	1,131,600	1,222,900
Beets	186,700	131,400
Green Beans	221,500	200,500
Green Lima Beans	33,330	39,550
Cabbage for Kraut	233,300	264,800
Spinach	89,300	85,000
Pimientos	12,650	22,000
	Bushels	
Cucumbers	7,993	10,064

Fruit production estimates for 1946, as reported by the National Canners Association show the following totals as grown for all purposes:

Commodity	Production 1945	1946
	(1000 bu.)	
Apples	68,042	121,520
Peaches	81,504	86,448
Pears	34,011	35,488
	Tons	
Apricots	193,600	343,400
Sweet cherries	101,790	102,550
Sour cherries	46,400	112,810
Figs, not dried	14,000	18,000
Figs, dried	32,600	35,500
	Barrels	
Cranberries	656,800	846,200

Storage

Frozen fruits and vegetables in cold storage, December 1, were considerably higher than a year ago. These commodity stocks are reported by the National Canners Association:

Frozen Fruits	Dec. 1, 1945 1,000 lbs.	Nov. 1, 1946 1,000 lbs.	Dec. 1, 1946 1,000 lbs.
Apples	39,923	39,276	48,608
Blackberries	20,088	24,415	22,435
Cherries	25,683	77,401	71,331
Young, Logan, Boysen, etc.	10,812	15,893	16,219
Raspberries	14,710	27,326	25,266
Strawberries	23,891	54,738	49,010
Grapes	18,853	17,341	17,120
Plums and prunes	17,384	25,191	22,792
Peaches	69,816	68,062	63,351
Fruit juices and purees	24,309	33,349	32,388
Apricots	31,433	38,022	34,972
Blueberries	16,443	16,896	15,375
All other fruits	63,781	72,347	77,960
Total	377,126	510,257	496,827
Frozen vegetables			
Asparagus	8,836	20,369	18,609
Beans, lima	15,030	33,314	28,280
Beans, snap	18,095	31,654	28,470
Broccoli	4,522	13,829	13,781
Cauliflower	3,842	6,745	7,237
Corn, sweet	23,169	41,166	40,271
Peas, green	63,362	122,053	115,355
Spinach	15,413	23,673	26,242
Brussels sprouts	2,172	4,537	5,253
Pumpkin and squash	7,336	9,650	12,005
Baked beans	1,415	732	249
Vegetable purees	446	139	127
All other vegetables	34,906	43,412	54,436
Total	198,545	351,273	350,315

Indexes

Business Week's index of business activity was 189.3 for the week ending January 11, which compares with 188.5 the previous week, 184.9 a month ago, and 173.2 a year ago.

The commodity price index on food, compiled by the New York Journal of Commerce, stood at 180.3 for the week ending January 17. This compares with 185.0 for the previous week, 184.6 a month ago and 111.0 a year ago.

CONSTRUCTION NEWS

	Pending (thousands)	Total Awarded January (thousands)	Awarded 1946 (thousands)
Bakery	$1,125	$328	$4,883
Beverages	535	284	25,222
Canning and Preserving	200	.....	6,708
Cold Storage	945	75	9,187
Confectionery	.....	.....	2,525
Grain Mill Products	.....	380	15,395
Ice, Manufactured	.....	.....	1,170
Meats and Meat Products	380	55	4,202
Milk Products	1,545	515	17,363
Miscellaneous	1,490	755	41,529
	$6,220	$2,392	$128,184*

* Complete 1946 total.

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COOK-CHEX Retort Tags make it impossible for baskets or whole retort loads to be by-passed for labeling, packing, shipping or storing *unless the contents have been* completely cooked. Cook-Chex eliminates cooking errors, stops spoilage and waste, saves time and materials, safeguards customer goodwill and profits.

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4. If green, food *is* cooked, ready for labels.
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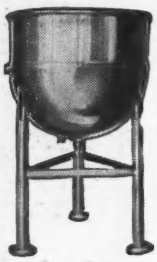

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What Washington Thinks

By R. S. McBRIDE, Washington, D. C.

HOSTILITIES END — The President's declaration of the end of hostilities on December 31 had numerous motives behind it. Not the least of these was the fact that any further delay in the announcement would have postponed for a full year the termination of the period during which the government pledges price maintenance for farm commodities. If Congress takes no different action, the floor under agricultural prices continues through December 1948. Congress may intervene and shorten the period, if it acts during 1947. But it seems unlikely that Congress would take such action likely to offend farmers in the election year, 1948.

NEW FREIGHT RATES—Freight charges on most goods will not rise as much as many have understood when reading that Interstate Commerce Commission had granted an increase of 17.6 percent for a majority of commodities. That authorized increase replaces a smaller one. The actual new freight burden on goods will generally be about 11 percent. Food shippers can safely use that average in most of their calculations.

FERTILIZER FOR FISH—It has long been known that the growth of fish in farm ponds can be greatly accelerated by providing a suitable type of fertilizer in the water. American application of that knowledge has recently begun in a number of states, including Alabama and Michigan, to name but two. It looks as though this means of making fish cultivation on the farm more profitable may be speeded by active propaganda of the fertilizer industry. If effective effort is made, it means a new competitive protein-food source outside the food factory.

CONTAINER SHORTAGE—Scarcity of sheet steel for can manufacture is vastly more significant in determining the number of cans that may be made now than is the continuing shortage of tin. Washington does little to improve the container supply, apparently still straying around in its own fog of misunderstanding of the public interest. It remains to be seen whether the new housing authorities will come out of this confusion or not. Unless they are guided out, it seems unlikely that container supply, whether metal, wood, or paper, will be much increased for a year.

THE LABOR INDEX—As wage rates rise higher, as Washington knows they will until some depression period comes, a new factor in judging management efficiency must be applied. A new operating technic must be judged now largely by its effect on the number of man hours required per unit of product made. Changes in almost every other factor are less important in the total cost.

HALFWAY BACK—Sugar supply in 1947 is officially estimated at about 12 percent above last year, but 14 percent below the average of the five prewar years, 1935 to 1939, inclusive. The disposition in Washington, however, continues to be that the housewife should get the benefit of rising sugar supply. When industrial users will begin to share substantially is not yet clear.

TARIFF CHANGES—Shortly there will begin discussions with 18 foreign countries in order to formulate new trade agreements intended to stimulate international trade. There are currently in progress preliminary hearings on the basis of which the State Department will decide what to recommend to the President as concessions in prevailing American rates of duty. Since there is little present foreign competition that threatens trouble for American manufacturers, it is rather difficult to demonstate wherein such cuts of duty are serious. Wise executives with long vision are, however, concerned as to what the effect may be a few years from now, when foreign countries with very low standards of living begin the manu-

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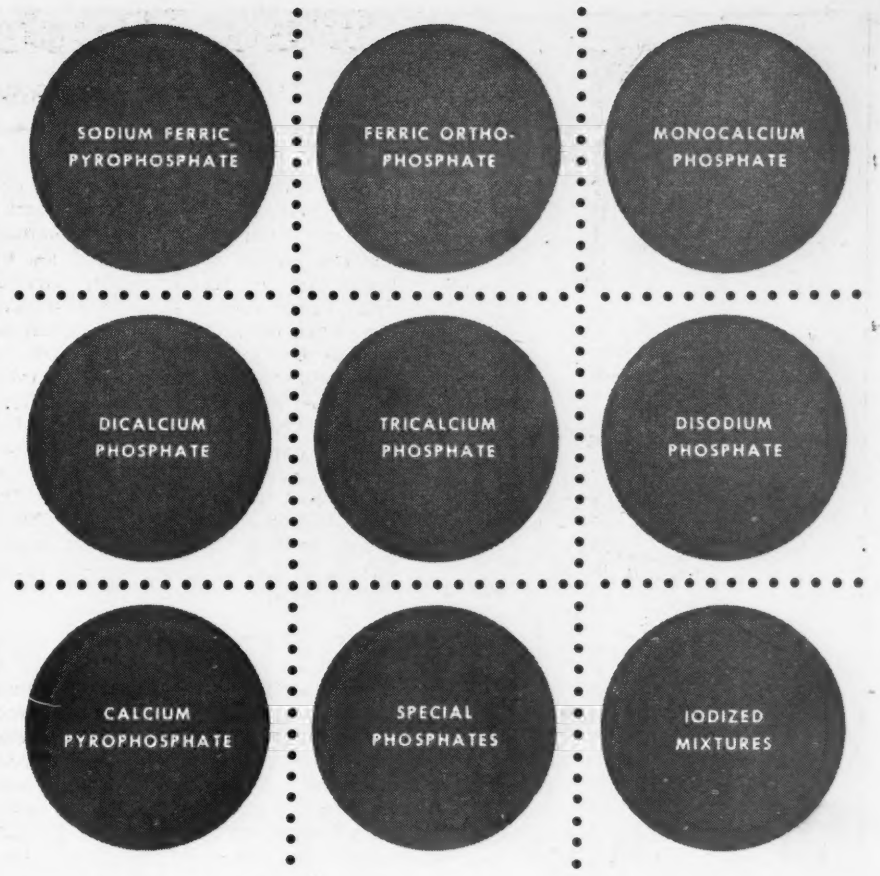
facture of exportable surpluses that they wish to send to the U. S. Industries fearing such later competition must now go to their Congressman with their ideas. It is practically too late to talk through the Committee on Reciprocity Information.

BEET WAGES—The race between wages and mechanization continues in the beet sugar industry. Recently the Department of Agriculture held its hearing in order to determine what would be the official findings as to proper wage rates for those working in the beet fields. Wages, especially for stoop labor, have now advanced so much that the very latest methods of mechanized planting, cultivation, and harvesting are proving economic. One wonders when beet growing will be completely mechanized. The answer appears to be that it can be almost any time now, especially since the plastic-coated segmented-seed supply makes possible the accurate planting of one beet in a hill.

FUTURE CONSTRUCTION — During the Veterans Housing Preference program, CPA denied permission for construction of 1,300,000 projects, each costing more than $15,000. At least as many more projects have not started simply because there was no application for approval. Thus the backlog of construction is certainly of the order of $40,000,000,000. This makes the delayed food factory construction and equipping, huge as it is, look small by comparison. Washington should be shown more of the importance of the food factory building needed or it may be delayed much too long for the good of the industry.

"FARMERS PAY TWICE"—The highly partisan effort of the Department of Agriculture in all general public questions is clearly spotlighted again by the departmental comments on new freight rates. Writing before ICC announced its findings, a department writer said, "The proposed increases would hit farmers twice, because the additional charge would be levied not only on what was shipped from farm to market, but also on the feed, fertilizer, and farm implements they bought for use on the farm." One wonders how farmers are any different in this regard than food factories, or anyone else in business for that matter.

GRADE ABUSES—The Bureau of Animal Industry now forbids the use of company brand names intermingled with "U. S. Grade" markers, which are ink stamped on meat at the time of inspection. This restriction was made necessary because some companies apparently sought to use the Federal marking in such close connection with the company name as to amount to unfair trade practice. It has got so that now the food manufacturers' conduct must appear as pure as Caesar's wife.



Monsanto Food-Grade Mineral Supplements

The expanding use of Monsanto food-grade mineral supplements is due largely to the fact that they are derived from elemental phosphorus that is better than 99.9% pure. Manufacturers and processors are thus assured of phosphoric acid and food phosphates of continuing uniformity and high product quality — definitely an asset in nutrition and sales.

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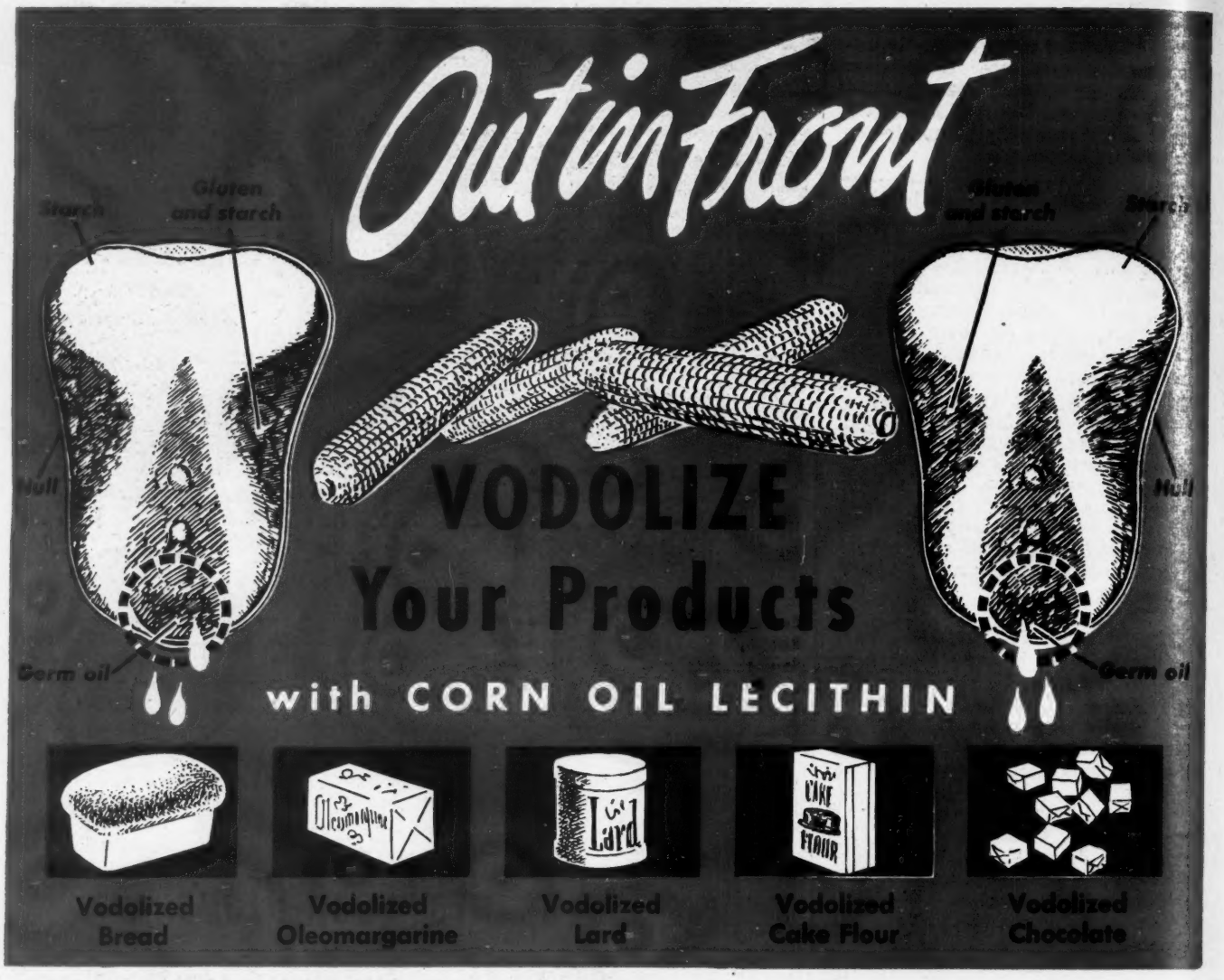

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INDUSTRY

American Maize-Products Co., New York, has announced the appointments of Charles F. Baumgart, to be in charge of all package goods sales and Arthur Doscher as field sales manager of the eastern division.

The Best Foods, Inc., has announced the appointment of Albert Brown as vice-president in charge of advertising and merchandising, and B. F. Nelson as vice president in charge of purchases.

E. H. Borchardt Co., Belle Glade, Fla., has formally changed its name to Florida Food Products Corp. Elmer Osking is president.

Caruso Foods, Inc., division of Airline Foods Corp., has announced the appointment of Frank di Bari as plant manager. He will supervise production at the Caruso plant in Long Island City, N. Y.

Citrus By Products Corp. has been created by a group of McAllen and Mission, Tex., canners. The new $400,000 industry will operate two dehydration plants at McAllen for drying citrus pulp and other residue from canning operations to be converted into stock feed. One plant also will process molasses from citrus peel. The plants will have a capacity of 12,000 or more tons of dried pulp this season.

Flo-Sweet Products Corp., subsidiary of Refined Syrups & Sugars, Inc., Yonkers, N. Y., has announced the appointment of J. P. Cody as executive vice-president. Mr. Cody has been largely responsible for the development of the line of packaged products for consumer and institutional distribution which will be handled by the Flo-Sweet Corp.

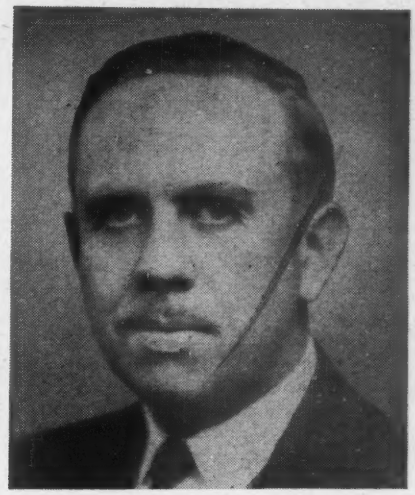
Goebel Brewing Co., Detroit, has entered the carbonated beverage field with the formation of a subsidiary company known as the Royal Crown Bottling Co. of Detroit. It will distribute a cola drink.

The Greylock Confectionery Co., Inc., Cambridge, Mass., has begun the manufacture of cream marshmallow. The company has installed a new line of automatic machinery for mixing, filling, labelling and casing.

Heidelberg Brewing Co., Covington, Ohio, has announced plans for a $300,000 expansion program including the purchase of the entire plant, buildings and real estate of the Sebastian Lathe Co., Covington. The new building will be used as a bottling plant.

T. L. SWENSON

Formerly director of the Western Regional Research Laboratory, Albany, Calif., T. L. Swenson has been appointed special assistant to L. B. Howard, chief of the Bureau of Agricultural and Industrial Chemistry.



A. C. FOSTER

Standard Brands Inc., has announced the appointment of A. C. Foster as chief engineer. He has been the organization's assistant chief engineer since June, 1945, having graduated from the University of Detroit as a mechanical engineer.

H. J. Heinz Co., Pittsburgh, has announced the retirement of three sales managers following 40 years of service. They are W. G. Taylor, in charge of the company's North Central region, with offices in Chicago; Hugh Murphy, manager of the West Central region, with headquarters in St. Louis, and Walter B. Tool, manager of the Eastern region, Long Island City, N. Y. Succeeding Mr. Taylor will be C. S. Anger. F. L. Abbott replaces Mr. Murphy, and B. C. Glenn succeeds Mr. Tool.

K. N. MERRITT

Appointment of Kinsey N. Merritt as vice-president in charge of traffic of Railway Express Agency, New York, succeeding the late C. A. Frey, has been announced by L. O. Head, president of the company.

Hollywood Brands, Inc., will locate a candy manufacturing plant in Montgomery, Ala. Arthur Langhoff will manage the operation, which will employ 300 persons.

Union Grain Elevator, Minneapolis, was damaged in December when fire destroyed a wooden grain storage elevator containing elevator machinery and approximately one million bushels of barley. The concrete storage tanks adjoining the wooden structure escaped with little damage. Union is owned by Froedtert Grain & Malting Co., Inc., Milwaukee.

United Biscuit Co. of America plans to erect a $2,000,000 plant near St. Louis, Mo. The new unit will employ about 600 people.

PERSONNEL

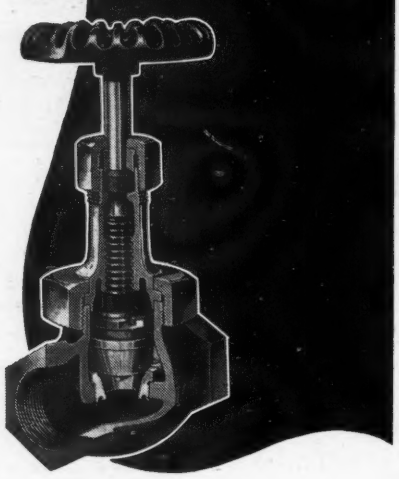
C. A. Abele, Chicago Board of Health, has been elected president of the Chicago Dairy Technology Society. F. W. Rayl is the new vice-president.

Luther K. Bowman has been appointed vice president in charge of administration for Chef Boy-Ar-Dee Quality Foods, Inc., Milton, Pa., division of American Home Foods. Mr. Bowman is president of the Pennsylvania Canners Association. Donald J. Huenink is the new vice president in charge of production.

Here's all you need...

to convert a regular type into a plug type valve...

SEATS AND DISCS INTERCHANGEABLE ★

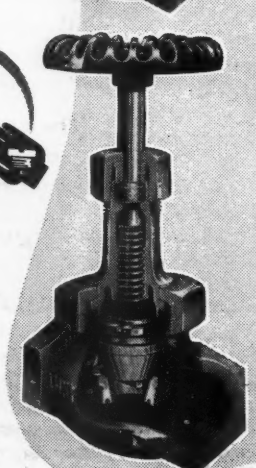


Just insert a plug type seat and disc in place of the regular type, and you change an *entire* Bronze "Renewo" Valve from regular to plug type—providing all the extra advantages of this type, including its ability to stand up under hard service. No other change is necessary. The plug type seat-and-disc combination is made to *fit perfectly* into a regular type valve of corresponding size and pattern. And you have this same interchangeability in Iron Body "Ferrenewo" Valves. You don't have to buy an entire new valve . . . you don't even have to take the valve out of the line. *Lunkenheimer interchangeability goes still farther. *All parts* of 200 lb. "Renewo" and 150 lb. "Ferrenewo" Valves (except bodies and bonnet rings) are quickly, easily, perfectly interchangeable. Fewer parts are needed; ordering and handling are simplified; repairs are facilitated. You save time, labor, money.

Write for a copy of Circular 567—

LET YOUR LUNKENHEIMER DISTRIBUTOR DEMONSTRATE . .

Your nearby Lunkenheimer Distributor will welcome the opportunity to show you actual samples and demonstrate the interchangeability of parts in "RENEWO" and "FERRENEWO" Valves. You'll find it a big factor in increasing efficiency, lowering costs.



THE LUNKENHEIMER COMPANY

CINCINNATI 14, OHIO, U. S. A.
NEW YORK 13, CHICAGO 6, BOSTON 10, PHILADELPHIA 7.
EXPORT DEPARTMENT: 319-322 HUDSON ST., NEW YORK 13, N. Y.

J. E. Caldwell, president of Ruth Sugar, Breaux Bridge, La., has announced that his company is purchasing the Vermilion Sugar Co.'s mill at Abbeville, La., for dismantling and moving to Florida.

Lewis L. Clarke has resigned as a director of Swift & Co., Chicago. He had served for 36 years. Henry T. Heald, president of the Illinois Institute of Technology, Chicago, will be nominated to fill the vacancy.

W. Melville Cribbs has resigned as general manager of the Chicago division of the National Candy Co. National Candy was purchased late in 1946 by the Chase Candy Co., St. Joseph, Mo.

Theodore U. Delson has been elected president and treasurer of Southland Frozen Foods, Inc., successor to Southland Products Co. The company's operations are centered at Plant City, Fla.

W. C. Dickmeyer, president of Wayne Candies, Fort Wayne, Ind., has been selected 1947 chairman of the Council on Candy, according to an announcement by Philip P. Gott, president of the National Confectioners' Association. Mr. Dickmeyer succeeds John H. Reddy of the New England Confectionery Co., Cambridge, Mass.

G. L. Elliot, formerly superintendent of Derby Foods, Chicago, has been elected vice president and assistant manager of the company. Derby Foods processes ready to eat poultry, peanut butter and meat.

E. J. Grimmett, formerly a division manufacturing manager, has been named director of manufacturing and engineering of the General Foods Corp. In his new capacity, he will report directly to Udell C. Young, vice-president. C. W. Cook, formerly a division manufacturing manager, has been named production manager for the Maxwell House Division and C. W. Rehor, until now a division manufacturing manager, will become production manager for the Associated Products Division which includes the Jello, Minute, Calumet, Log Cabin and Gaines products of General Foods.

Dr. B. W. Hammer, research bacteriologist for Golden States, Ltd., San Francisco, is on a three month leave of absence to complete revision of his book on bacteriology.

Dr. A. E. H. Houk has been named head of the Nutrition laboratory of H. J. Heinz Co., Pittsburgh. He formerly served as project chief and technical consultant for Standard Brands, Inc.

Arnie Mechs has been appointed superintendent of the Kraft Food Co.'s plant in Atlanta, Ga. He formerly was

In Silver—it's Sterling

In Seasoning—it's Stange

Stange's Cream of Spice Seasonings is the modern, uniform, dependable method of incorporating natural spice flavors into processed foods.

In Cream of Spice Seasonings, through the exclusive Stange process of total extraction, you get a seasoning containing ALL the essential oils and aromatic oleo resins of the NATURAL spices in a concentrated, easy-to-use form—with all foreign matter and unsightly waste material discarded.

Every Cream of Spice Seasoning has the same degree of strength—it's instantly soluble—and it comes as an individual spice flavor (cinnamon, pepper, ginger, allspice) or in premixed blends (apple butter seasoning, chili sauce seasoning, seasoning blends for packers of dehydrated soups, and seasonings for meat packers and sausage makers).

The Stange research laboratories and Home Economics staff will gladly help you on any seasoning problem you may have.

42 YEARS OF SERVICE TO THE FOOD INDUSTRY

Stange's CREAM OF SPICE Seasonings

• WM J • STANGE CO • 2536 W. MONROE ST., CHICAGO 12, ILL.

A nationally-famous food processor presented Niagara Filter this

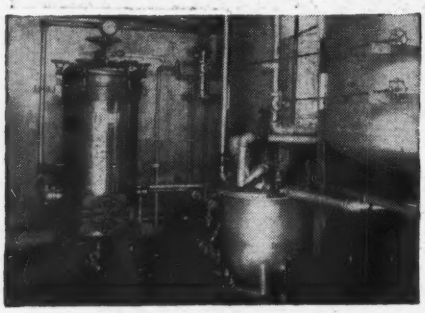
PROBLEM:

in manufacturing his product, the chief by-product is *pork fats* which must be conditioned to meet food and drug specifications for edible products before it can be marketed.

The final treatment of the by-product pork fats is its decolorization with activated carbon.

In this case the carbon was filtered out of the pork fats on a horizontal-type filter—a procedure that resulted in operational problems and considerable labor.

At the request of this food processor, Niagara Filter submitted the by-product pork fats to pilot filtration. The results proved that this particular problem would be solved by a #60 Niagara Filter with Niagara's patented all-metal, stainless, solderless leaves.



The Niagara Filter was installed —with these results:

1 filtration was completed in one-tenth the time!

2 labor was reduced to one-man operation —the difficulties encountered in removing carbon cake, torn filter papers, etc., on the horizontal press, were completely eliminated!

3 a simplified hook-up and the totally enclosed Niagara Filter converted this filtration procedure from the previous hot, messy, laborious operation to a net, clean, simple job.

4 Now 30,000 pounds of hot fats are processed in less than 2 hours in a single run. Instead of 5 to 7 cleanings per day previously required, the Niagara Filter need be cleaned *only once a day!*

Niagara Filter invites you to submit your filtration problem for analysis. If there is a filtration problem you want solved—if you want your operation simplified, call for an "N.F.E."*!

An "N.F.E." is a Niagara Filtration Engineer—a trained graduate engineer with years of actual field experience in filtration in the chemical, food, fermentation and process industries. A staff of "N.F.E."'s is ready to tackle your filtration problems! Present it—no obligation, of course.

niagara filter CORPORATION

3091 MAIN ST. AMHERST 2100 BUFFALO 14, N. Y.

personnel manager and acting assistant to Kraft's superintendent in the Green Bay, Wis. plant. In his new capacity, Mr. Mechs will direct the activities of the Atlanta plant, which employs 200 and produces many types of processed cheese as well as margarine.

C. B. McCord has been named vice president in charge of sales of Shedd-Bartush Foods, Inc., Detroit, manufacturer of margarine. Mr. McCord had been with Best Foods for many years.

W. J. Ocken, bakery engineer, is now superintendent at the H. Piper Baking Co., Chicago.

Nathan Pike has returned to the home office of American Molasses Co., in New York, after having been in charge of production at the Chicago plant. Mr. Pike will be head of the new products department.

A. K. Richter, formerly assistant to the head of the dairy and poultry operating department of Swift & Co., Chicago, has been named head of that department, succeeding the late R. C. Sims. Jack Adams succeeds Mr. Richter as assistant.

J. J. Vollertsen, assistant to the general manager of Armour & Co. Laboratories, Chicago, and an employee of the company for 37 years, retired on Dec. 20. Dr. Vollertsen also was in charge of the scientific aspects of quality control in the laboratory and an adviser to all research and control laboratory operations.

Harry Waybright, Veradale, Wash., has begun construction on a $500,000 quick freeze plant to process Spokane valley fruits and vegetables for distribution throughout the Pacific Northwest.

DEATHS

Frederick G. Adamson, 80, a founder and director of Stephenson-Adamson Manufacturing Co., Aurora, Ill., December 29.

Jacob Blumlein, 76, president of S. & W. Fine Foods, Inc., San Francisco, for 25 years, and a company executive since its founding in 1896, died December 11.

William A. Caswell, 53, superintendent of the Empire State Canning Co., Stacy Basin, N. Y., recently, in Utica, N. Y.

Carmelo Gugino, 77, founder of the Peoples Macaroni Co., Buffalo, recently.

Sam Isaly, president of Isaly Co., Youngstown, Ohio, and member of

CASE HISTORY No. 12

One in a series of factual experiences of a group of American manufacturers with Multiwall Paper Bags.

COST COMPARISON
(Per Ton)

	100-lb. Drums	100-lb. Paper Bags
Container cost . . .	$14.00	$2.40
Labor cost	4.16	1.03
Total bag and labor cost	$18.16	$3.43
Saving per ton, paper bags over drums		$14.53

CLASS OF PRODUCT PACKED

CEMENT	FERTILIZER
CHEMICALS	FOOD
FEEDSTUFFS	MISCELLANEOUS ✓

PRODUCT CHARACTERISTICS

ABRASIVE	GRANULAR ✓
CORROSIVE	HEAVY
DELIQUESCENT	HYGROSCOPIC ✓
FLUFFY	LIGHT
FREE-FLOWING	VISCOUS

ST. REGIS PACKAGING SYSTEMS are designed to meet a wide range of product requirements and plant layouts. Packers are available in a variety of sizes and types, with filling speeds as high as twenty-four 100-lb. bags per minute — with one operator. Nearly 400 products — rock products, fertilizers, chemicals, foods, and feeds — are now being packaged in sturdy, low-cost multiwall paper bags.

small MANUFACTURER *makes big savings* WITH A ST. REGIS PACKAGING SYSTEM

Small manufacturers, as well as large ones, can benefit by the economies and efficiency of a St. Regis Packaging System.

An outstanding example of how successfully the system was applied by one small manufacturer is found in the case of the Stevens Soap Corporation, of Brooklyn, N. Y. This company manufactures soap powder which is used as a general purpose cleaning agent and as an ingredient of abrasive cleaners.

Faced with the high cost of drums being used for packaging of the powder, and confronted by a shortage of labor, the Company installed a labor-saving 100-LS St. Regis packer in 1944 and switched to multiwall paper valve bags. Here are some of the immediate results:

- Container costs dropped from $14 to $2.60 a ton — a saving of 81%.
- Packaging output, although limited because of material shortages, increased from 2,500 to 6,000 lbs. per hour.
- Packaging costs went down 80%.
- Labor requirements dropped from five to three men.
- Much valuable storage space was saved by compact Multiwalls.
- Dust was eliminated from the packaging operation.

So satisfied is the Company with its St. Regis Packaging System that it has ordered and received shipment of another 100-LS packer in anticipation of increased output when shortages of ingredients are eliminated.

Mail this coupon to get the detailed picture story of how a St. Regis Packaging System helped this small manufacturer achieve economical and efficient packaging.

Left: *One man operates the St. Regis 100-LS packer.*
Right: *Conveyor takes filled bags to loading point.*

MULTIWALL

ST. REGIS SALES CORPORATION
(Sales Subsidiary of St. Regis Paper Company)

NEW YORK 17: 230 Park Ave. CHICAGO 1: 230 No. Michigan Ave.
BALTIMORE 2: 1925 O'Sullivan Bldg. SAN FRANCISCO 4: 1 Montgomery St.

Mail this coupon for the complete story

Allentown Atlanta Birmingham Boston Cleveland Dallas Denver Detroit Franklin, Va. Los Angeles Nazareth, Pa. New Orleans No. Kansas City, Mo. Ocala, Fla. Oswego, N. Y. Seattle Toledo
IN CANADA: St. Regis Paper Co. (Can.) Ltd., Montreal, Vancouver.

Without obligation, please send me full details regarding "Case History" No. 12, outlined above.

NAME_____

COMPANY_____

ADDRESS_____

Lo-Bax *always* gets there first...quickly kills bacteria *before* they can spoil the quality of your food products.

Lo-Bax, the concentrated, efficient chlorine bactericide, helps prevent costly food spoilage and improves quality standards by rigidly controlling bacteria and sanitizing all surfaces with which food comes in contact.

Easy to handle—winter or summer—Lo-Bax kills bacteria almost instantly . . . at low cost. It contains 50% available chlorine, dissolves quickly in water—hot or cold, hard or soft—to make clear rinse solutions.

Let Lo-Bax be *first* with you, and you'll have better bacteria control than ever before! THE MATHIESON ALKALI WORKS (INC.), 60 East 42nd Street, New York 17, N. Y.

Pioneer Manufacturers of Chlorine Products for Nearly Fifty Years

Mathieson
LO-BAX

Lo-Bax . . . Super-Nufos . . . HTH-15 Dry Ice . . . Carbonic Gas . . . Ammonia, Anhydrous & Aqua . . . Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Liquid Chlorine Chlorine Dioxide . . . PH-Plus . . . Synthetic Salt Cake . . . Sodium Chlorite Products . . . Sodium Methylate

LO-BAX CHLORINE BACTERICIDE -50% Available Chlorine

LO-BAX SPECIAL — A superior chlorine bactericide in granular form — packed in 2½-lb. bottles, ½ doz. to the case; and in 1-lb. bottles, 1 doz. to the case.

LO-BAX POWDER — A highly efficient chlorine bactericide packed in 1¾-lb. bottles, 1 doz. to the case.

board of directors, American Butter Institute, December 3.

Ashby Miller, 80, a former general manager and treasurer of the General Mills Corp., December 10, in Winchester, Va.

Earl H. Russell, 47, manager, treasury and payroll departments of the Kraft Foods Co., Chicago, December 29.

ASSOCIATED INDUSTRIES

Bemis Bro. Bag Co., St. Louis, has announced the opening of a sales office in Pittsburgh, under the management of Ellis H. Deitrick.

Continental Can Co., Inc., New York, has announced the election of Hans A. Eggerss to the presidency of the company. Carle C. Conway, who has been acting both as chairman of the board of directors and as president, will remain chairman of the board and chief executive officer of the company. Mr. Eggerss joined the company in 1942, when it acquired The Container Co. of Van Wert, Ohio, of which Mr. Eggerss had been president.

George J. Foss, Jr., formerly director of the Chicago laboratories of Rheem Manufacturing Co., Chicago, has joined the technical staff of White Cap Co., Chicago.

Kieckhefer Container Co., Milwaukee, plans construction of a one-story plant at Bensenville, Ill., to manufacture paper milk bottles. The unit will be operated by the Cherry River Paper Division of Kieckhefer.

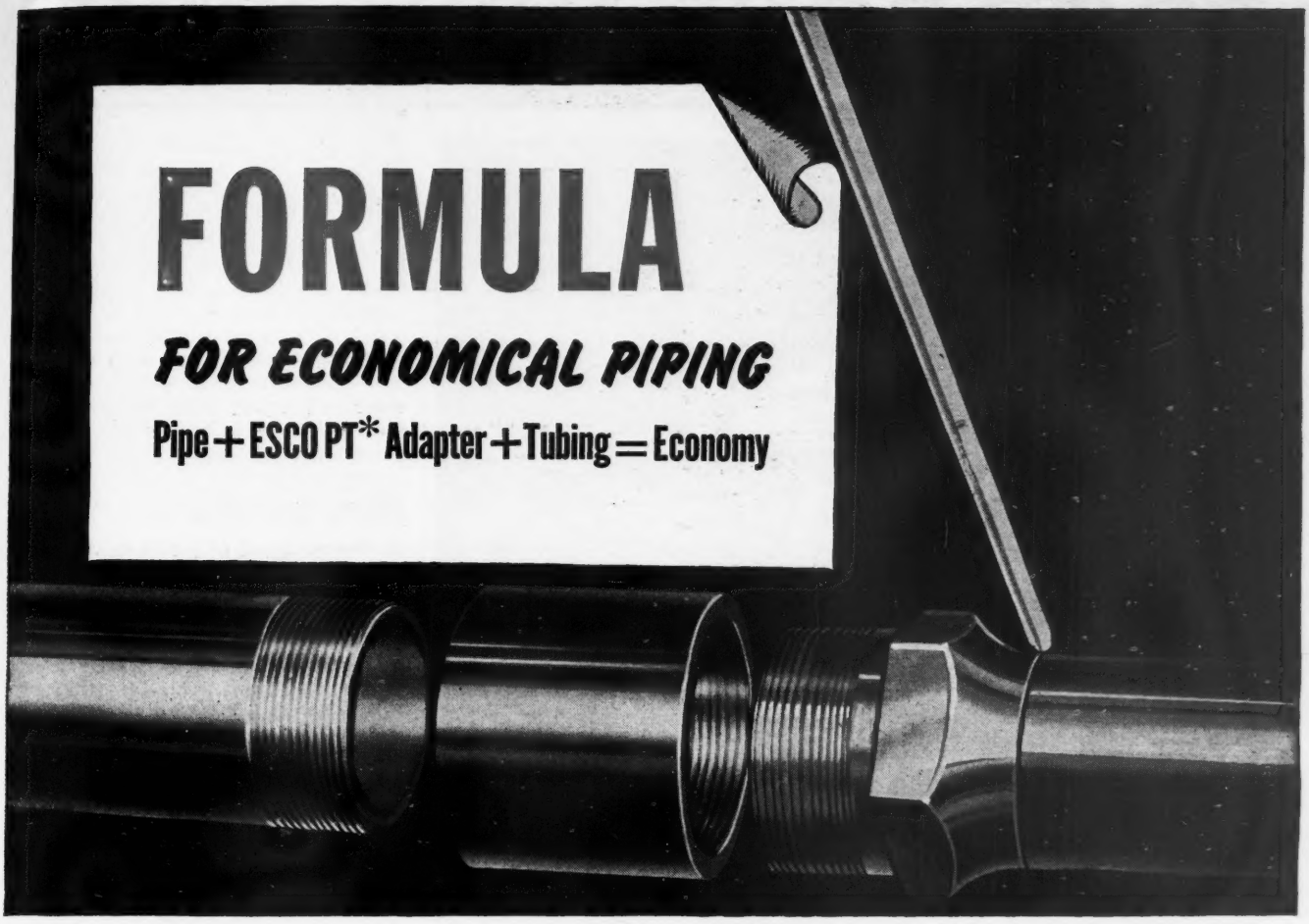
Leberco Laboratories announces that it is moving from 36 Roosevelt Ave., Bloomfield, N. J., to 123 Hawthorne St., Roselle Park, N. J.

Lebanon Steel Foundry Co., has announced the appointment of John H. Boyd as district manager in charge of the branch office in Atlanta.

Monsanto Chemical Co. has begun construction of a new pilot plant at its Plastics Division in Springfield, Mass. The $175,000 building will be completed by early summer.

National Folding Box Co., Inc., has elected Walton D. Lynch as president. He has been with the company since 1919 and has concluded his second term as president of the Packaging Institute.

Owens-Illinois Glass Co., Toledo, Ohio, has appointed Kent S. Upham as manager of the Prepared Foods Division.



The cost of your new piping system can be greatly reduced by *ESCO* PT* adapters. These make possible the joining of IPS piping and fittings to thin wall tubing, which often can be used instead of the more costly IPS piping. *ESCO* PT* adapters...

Permit thin wall tubing to be used in combination with IPS piping and screwed fittings.

Resist corrosion — cast of ESCO alloy 45 (type 317) stainless steel.

Smoothly machined inside walls for use in food processing and chemical plants.

Moderate cost — little more than ordinary stainless nipples.

Hexagonal section for use with wrenches.

Provide easy pre-fabrication and quick disassembly of piping systems.

ESCO STAINLESS STEEL FOR ULTIMATE ECONOMY

ELECTRIC STEEL FOUNDRY

2145 N. W. 25th AVENUE • PORTLAND 10, OREGON

OFFICES

CHICAGO, ILLINOIS
EUGENE, OREGON
HONOLULU, T. H.
LOS ANGELES, CALIF.
NEW YORK CITY, N.Y.
SAN FRANCISCO, CALIF.
SEATTLE, WASH.
SPOKANE, WASH.

IN CANADA — ESCO LIMITED, VANCOUVER, B. C.

ESCO PT* adapters are cast in four sizes:

1″ IPS to	1″ OD x 16 gauge wall
1½″ IPS to	1½″ OD x 16 gauge wall
2″ IPS to	2″ OD x 16 gauge wall
3″ IPS to	3″ OD x 16 gauge wall

Other Sizes on Order

Perhaps ESCO PT* adapters can save money for you in your piping system. It's easy to find out—just fill in and mail us the coupon below, or write for data and prices.

*** PIPE-TO-TUBE**

ELECTRIC STEEL FOUNDRY
2145 N. W. 25th Avenue, Portland 10, Oregon

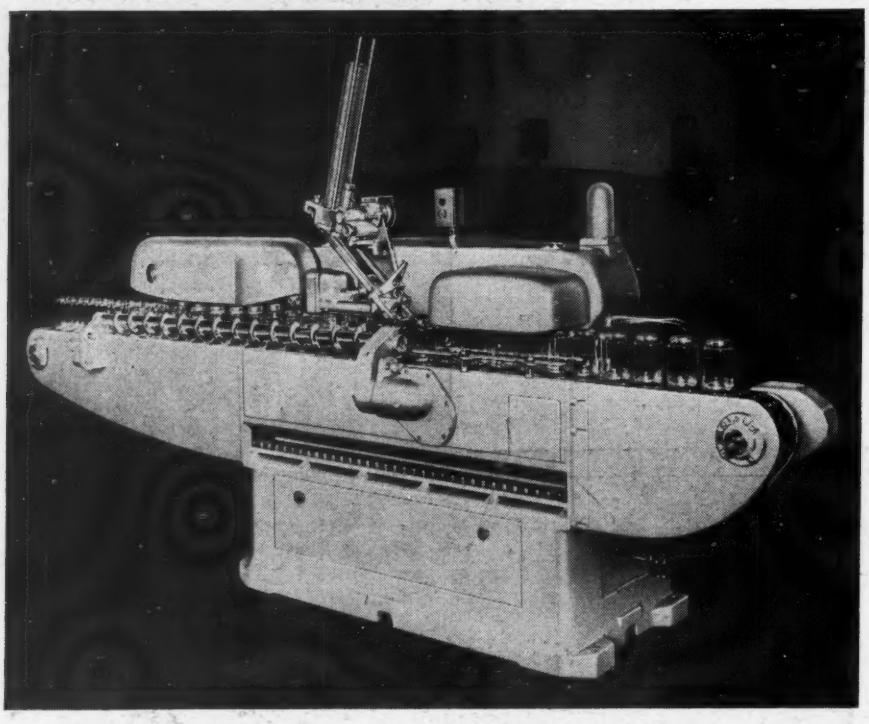
Please send data and prices of ESCO pipe-to-tube adapters to:

Name.....

Address.....Zone.....

City.....State.....

FOOD EQUIPMENT NEWS



Straight line vacuum capping machine seals 75 to 250 containers per minute.

Vacuum Capping Machine

AN automatic, high speed, straight-line vacuum capping machine, especially designed and developed for the application of Anchor AH-N Caps on glass jars and bottles having a pry-off ledge or a shoulder pry-off finish is announced by Anchor Hocking Glass Corp., Dept. I, Lancaster, Ohio. The seal is effected by dry, live, superheated steam, injected into the headspace of the container as the cap is automatically picked off the end of the feed chute. The cap is applied while the headspace is saturated with steam—the resultant vacuum created by condensation of the steam causing the closure to be held in place. To assure that the cap is securely seated the package travels under a short auxiliary sealing belt. Any desired degree of commercial vacuum on hot or cold packed products can be obtained and maintained by a simple adjustment of the steam flow. The machine has a sealing range of 75 to 250 or more containers per minute. It will apply caps from 27 mm. to 90 mm., inclusive, and handle jars with heights ranging from 3 in. to 8½ in. and diameters from 2 to 4 in.

Accordion Conveyor

A PORTABLE conveyor, that can be extended from 35 in. to 100 in., is easily set up, and capable of being formed quickly into practically any shape, is produced by Food Machinery Corp., Dept. I, Riverside, Calif. Users have found that it saves time, space and labor, reduces package handling cost and ends aisle jamming. A section may be moved from one part of a plant to another by simply turning it over. The rollers of the conveyor are used as wheels, thereby rolling the section to its new location.

Close Coupled Pumps

A LINE of close coupled pumps known as Compacunits has been recently developed by the Warren Steam Pump Co., Inc., Dept. I, Warren, Mass. Built in capacities of from 5 to 300 gpm. against heads of 15 to 500 ft. The pumps are supplied with either electric motors or turbine drive. By removing casing bolts and rotating casings, four discharge direction can be obtained, making it possible to use the pumps in various positions. Other special features include: An anti-swirl baffle in the suction head to prevent vapor lock; heavy section renewable rings to protect casings from wear at hydraulic seal, and extra deep stuffing box containing seven rings of packing.

Dairy Cultures

FIVE new types of dairy cultures, including buttermilk, Acidophilus, Bulgarian, Yoghurt, cottage cheese and butter cultures are available from General Biochemicals, Inc., Dept. I, Chagrin Falls, Ohio. Each culture is prepared from strains of organisms carefully selected to produce the most desirable flavor and aroma for their specific use, then blended and fixed by sub-zero drying.

Heating Jacket

GYCO heating jackets for laboratory flasks, with exterior coverings of glass cloth impregnated with an aluminum vinyl resin, are made by Scientific Glass Apparatus Co., Inc., Dept. I, Bloomfield, N. J. Plain glass fabric used on earlier heating jackets had the disadvantage of being soiled easily and lacking an effective cleaning method. The new covering permits Gyco jackets to maintain an attractive appearance in the laboratory, despite long and frequent handling. The vinyl resin also withstands most acids and laboratory reagents. The heating elements are entirely insulated with glass

Accordion type conveyor can be extended from 35 to 100 in., and formed into any shape.

Treating apple trees with insecticide fog.

yarn, then woven into a snakelike coil which is sewn with glass yarn in spiral fashion directly to the inner surface of the jacket, achieving intimate contact of the elements with the vessel to be heated.

Fog Generator

USING steam generated at high pressure to atomize insecticides and project them at high velocity in the area to be treated is the peacetime role of a fog generator manufactured in wartime to mask troop movements. The resulting fog has quality of drift and permeability not possible with ordinary spray or dusting equipment. The applicator can be used for pest control on field crops as well as in orchards, to treat livestock, to fog buildings for eliminating various kinds of insects, for application of hormones to prevent drop of fruit and for destruction and control of weeds. It is made by Besler Corp., Dept. I, Emeryville, Calif.

Motor Hand Truck

A MOTORIZED hand truck making systematic materials handling possible for all types of food processing plants, food warehouses and similar facilities, is produced by Automatic Transportation Co., Dept. I, 149 W. 87th St., Chicago 20, Ill. It is the Transtacker, a new battery-powered high-lift tiering unit which does the work of a fork lift or high-lift platform truck where weight, size, speed or cost make the larger units impractical. It is of special importance to the food industry since it handles vertical tiering of unit loads in production and storage facilities where floor and elevator capacities are limited. Built for load ranges from 2,500 to 4,000 lb.

Cooling Tunnel

A TUNNEL designed to reduce the technical problems of cooling chocolate to a simple automatic operation is produced by J. W. Greer Co., Dept. I, 119 Windsor St., Cambridge 39, Mass. A feature is the sectional steel conveyor belt that presents a cold surface to the bottom of the chocolates through which the heat is quickly transferred. Air from the refrigeration coils is discharged under this belt and flows over it to the bunker box taking up heat from the chocolates so that the entering goods are met with the warmest air. Chocolates are subjected to moderate cooling so as not to injure the quality of the gloss. Tunnel sizes: width, 24, 32 and 42 in.; length, multiples of 8 ft.

Condensate Return System

A HIGH pressure condensate return system, for use with unit heaters in high pressure space heating of commercial and industrial buildings, is produced by Cochrane Corp., Dept. I, 17th St. and Allegheny Ave., Philadelphia, Pa. The hot condensate and entrained air are drawn from the heating coils by a specially designed centrifugal pump. Air is eliminated by passing through an air separator and the condensate is returned to the boiler at maximum temperature and pressure. The circuit from boiler, through equipment, and back to boiler is completed in a closed system without substantial drop in temperature. Performance of the unit is verified by the pressure gage on the inlet together with the pressure gage and thermometer on the outlet.

Adhesive

USING synthetic rubber as a base, the United States Rubber Co., Dept. I, 1234 Avenue of the Americas, New York 20, N. Y., has developed an adhesive for sealing corrugated paper cartons. Known as U. S. Royal Adhesive M6165, this cement produces a permanent bond resistant to extremely high and low temperatures. May be applied with a spray gun.

Combustion Control

CONSISTING of a phototube and amplifying system housed in a dust-tight aluminum case, Fireye Combustion Control Type F 18TS, provides reliable safeguards against flame failure and low boiler water level in industrial oil burning equipment. Mounted on the furnace wall and

Tiering heavy skid loads of sugar with touch-of-thumb control of motorized hand truck.

DON'T TOLERATE

EXTERMINATE!

Now is the time to plan your Plant Fumigation . . .

To our many old clients and to new ones too, this is a reminder to plan your spring and summer plant fumigation now.

We want to fit our schedule with yours to eliminate any chance of interrupting your plant production schedules. Just get in touch with our nearest branch office, listed below. We will immediately arrange your plant fumigation to suit your schedules and convenience.

It is as easy as that—and for any new client, estimates will be cheerfully and immediately submitted—without obligation.

Here Is What Vogel-Ritt Exterminating and Fumigating Engineers Do For You . . .

Survey your plant

Check all possible modes of pest entry

Recommend correct and effective stoppage

Then - EXTERMINATE - by the best method

Again—let us remind you—

"PEST CONTROL DOES NOT COST— . . . IT PAYS"

VOGEL-RITT INCORPORATED

PIONEERS IN PEST CONTROL

2212 Chestnut Street, Dept. A

Philadelphia

CONTACT OUR NEAREST BRANCH OFFICE:

ALLENTOWN, PA. 220 N. 6th Street

BALTIMORE 233 St. Paul Place

CHICAGO 174 W. Jackson Blvd.

CINCINNATI 123 E. Court St.

COLUMBUS, OHIO 253 S. High St.

DETROIT 6432 Cass Avenue

HAGERSTOWN, MD. 314 W. Washington Street

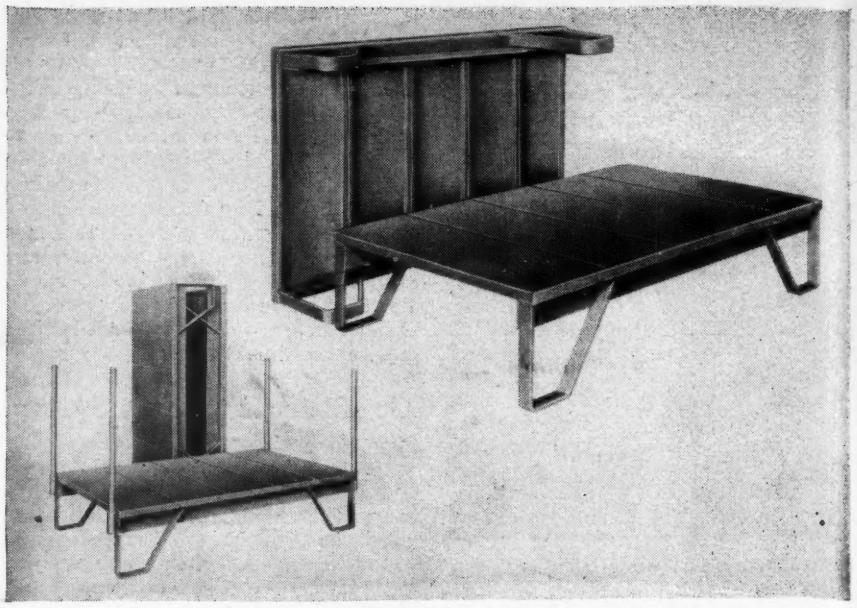
HARRISBURG, PA. 2107 N. 6th Street

TRENTON 128 Calhoun Street

VINELAND, N. J. 7th and Landis Avenue

ATLANTA No-Vex Co. of Atlanta 596 Peachtree St. N. E.

MACON, GA. No-Vex Co. of Macon 454 First Street



All-steel skid platform with specially designed legs to facilitate stacking.

aligned in a manner which permits the photoelectric cell to observe the flame, it instantly cuts off fuel or sounds an alarm whenever the flame fails. It protects against low boiler water level by means of a probe mounted parallel to the water column. Fireye is made by Combustion Control Corp., Dept. I, 77 Broadway, Cambridge, 42, Mass.

Skid Platform

AN ALL-STEEL skid platform, in any required size and for any specified hand or electric lift truck, is made by Market Forge Co., Dept. I, Everett, Mass. Deck panels, made of medium gage, high-tensile strength steel, welded to "Z" bars, provide a smooth, even load carrying surface. Legs of solid bar steel are designed to permit stacking of platforms on end when empty. Platforms of galvanized or stainless steel, or aluminum may also be obtained. Platforms with integrally welded corner stake sockets are also obtainable.

Insecticide

A NEW insecticide toxicant, Toxaphene, reported to be effective against such insect pests as cotton insects, tobacco horn worm, Mexican bean beetle, flies, clothes moths, and roaches, has been announced by Hercules Powder Co., Dept. I, Wilmington, Del. Preliminary tests indicate that it is fully as effective as DDT against certain insects, and more effective against others. It is available in eight forms.

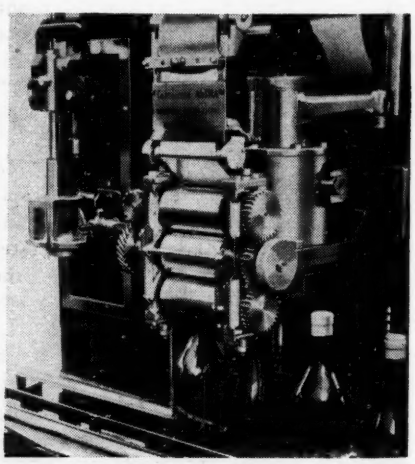
Bottling Assembly

AN automatic assembly, for bottling and wrapping wines and other nonsparkling liquids in bottles of various heights and diameters at speeds up to 80 per min., is built by Establish Chelle, Paris, France, and distributed in this country by Chelle Bottling Equipment Co., Dept. I, 419 E. 57th St., New York, N. Y. The assembly consists of a gravity siphon filler, and corking, capsuling, labeling and wrapping units completely synchronized by means of a common shaft, motors and moving gears. Each unit is controlled by an electric relay which is itself actuated by the bottle on the conveyor.

Two means are provided for capsuling: (1) Preformed capsules are placed on the bottles by hand and formed around the neck of the bottle by the rotating capsuling head, and (2) capsules are stamped from a strip of foil and hydraulically formed onto the bottle neck. Other assemblies, designed for smaller wineries, consist of individual machines, each fulfilling two or possibly three of the above operations.

Plastic Bottle Caps

BOTTLE caps and seals made of a tough, durable plastic material that is highly resistant to acids and alkalies, as well as to moisture, are produced by the General Electric Co. Chemical Dept., Dept. I, Pittsfield, Mass. The



Machine stamps out and applies capsules.

VANILLA CREAM FILLINGS

Golden Vanilla Cream Fillings

Chill this rich custard cream in flaky pie shells lined with banana slices, or pineapple shreds, top with whipped cream, and feature the products in bakeshop or restaurant. Use this filling for the daintier, finer types of eclairs, cream puffs, or Boston cream pies.

A. Liquid Milk (4 qts.)	8 lbs.	8 oz.
Granulated Sugar	1 lb.	5 oz.
Salt		¼ oz.
B. **PURITY "C"**		**8½ oz.**
Liquid Milk (1 pt.)	1 lb.	1 oz.
C. Egg Yolks	1 lb.	
D. Vanilla Extract		1¼ oz.
	12 lbs.	8 oz.

(Follow method for Milk Fillings in Purity "C" Booklet)

Always free of chunkiness or excessive stiffness

PURITY "C" has built an outstanding reputation as a starch thickener that yields vanilla cream fillings with a velvety smooth texture — fillings that cut and serve without spilling, but still retain an eye-appealing semblance of flow.

Don't neglect these cold weather profit items: Eclairs • Cream Puffs • Napoleons • Vanilla, Chocolate and Boston Cream Pies. Make them with tested PURITY "C" recipes. Watch your customers come back for more and more!

Try PURITY "C" for Golden Vanilla Cream Fillings! Fill flaky pie shells brimful with this velvet-smooth cream. Let its vanilla flavor stand out in all its taste-tingling goodness — unconcealed by the cereal flavor found in regular corn starch.

Try PURITY "C" for fruit pies, too. Fruit colors retain their natural brilliance. And fruit flavors stand out in all their orchard freshness.

PURITY "C" is another product of National's Food Laboratory research that has produced a specialty starch for every baking need. Kitchen tested recipes that have increased sales in bakeries, hotels and restaurants are now available in our PURITY "C" Booklet. Write for your copy — NOW!

National also produces: MELOJEL, a double-refined corn starch; FLOJEL candy starches in all accurately controlled fluidities; MOLDING STARCH properly lubricated for gum drops, etc.; PURITY GLAZE, an oil-sealer for coating almonds; and PURITY "PWS" for salad dressings.

Offices: 270 Madison Avenue, New York 16; Boston, Philadelphia, Atlanta, New Orleans, Indianapolis, Chicago, San Francisco and other principal cities. In Canada: Meredith, Simmons & Co., Ltd., Toronto. In Holland: Nationale Zetmeelindustrie, N. V., Veendam.

National STARCH PRODUCTS

STARCHES — *AND SPECIALTIES WITH EASILY DEMONSTRATED SUPERIORITY*

QUICKER HEATING

• Small Size
• Light Weight
• One Moving Part
• Low Price

OVER 500,000 SOLD

Sold by more than 100 Mill Supply Distributors throughout the U. S. A. See your supply house or write for Catalog T-1739.

YARNALL-WARING CO.
127 Mermaid Avenue, Phila. 18, Pa.

YARWAY

IMPULSE STEAM TRAP

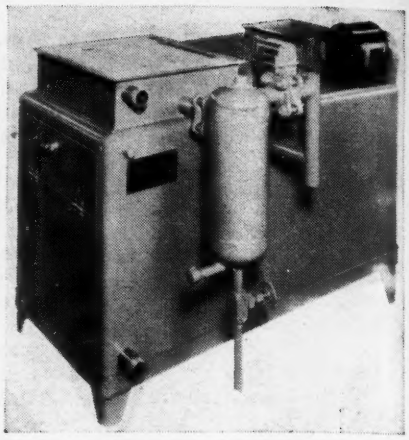
new caps are made to shrink to a tight fit on the bottle and completely seal the contents from air and moisture. By placing them over corks or glass stoppers they provide a perfect lock which is especially valuable during shipment. Produced in a variety of colors, the caps and sleeves are made in varying diameters and thicknesses to provide the desired protection. They can be crimped any length with a trademark added, if desirable.

Refrigerant Condenser

To fit the needs of users of refrigeration systems ranging from 2 to 7 tons, Niagara Blower Co., Dept. I, 405 Lexington Ave., New York 17, N. Y., has introduced the "Bantam" Aeropass Condenser. It operates under automatic control using the spray water principle. The refrigerant is condensed without material consumption of water; 1000 B.t.u. are removed for every pound of water evaporated. Special features included are: "Duopass" pre-cooling coil which prevents the deposit of scale from use of hard water; "Oilout" which removes oil from the refrigerant line between the Duo-pass coil and the sprayed coils, and the "Balanced wet bulb control" for maintaining uniform head pressures the year round.

Turret Truck

A NEW type of industrial truck, devised by engineers of Salsbury Motors, Inc., Dept. I, Pomona, Calif. combines the mobility of a rolling ball with the rugged power needed to move heavy loads. Using the Salsbury "Power-Package," consisting of a 6 hp. gasoline engine geared to a drive wheel through a fully-automatic clutch and transmission the "Turret", as it is called, can be instantly turned to provide power in any direction. The automatic transmission and automatic clutch eliminate gear shifting and the operator needs only feed gasoline to

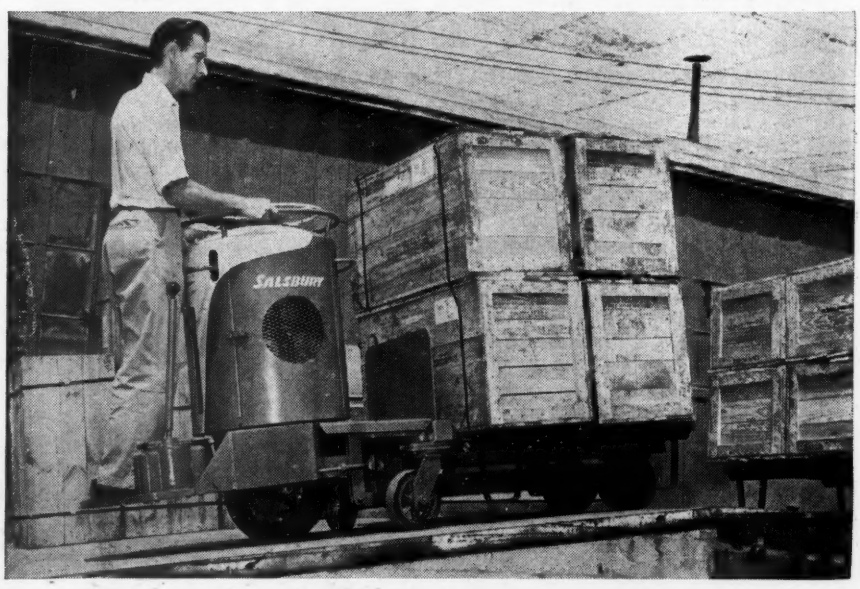


Refrigerant condenser for small systems.

go and apply his brake to stop. No reverse is needed, since the Turret turns completely around. Three models are in production: (1) the Turreteer, a platform-lift truck with four widely-spaced wheels to give steady support to the load; (2) the Turretug, a short, powerful tractor built for trailer systems with a 28-in. turning radius. It can exert a maximum drawbar pull of 500 lb., and is fitted with all standard type couplers; (3) Turretruk, a cargo truck with a large deck, that fits into inter-factory transportation needs, as a luggage carrier in travel terminals, or in any other place where a cargo carrier with a one-ton capacity is needed.

Spray Dry Nozzle

A LARGE capacity nozzle for use in various types of spray drying operations, such as milk or egg drying, has been introduced by Spraying Systems Co., Dept. I, 4061 W. Lake St., Chicago 24, Ill. The nozzles are made of stainless steel with wearing parts of either hard steel or tungsten carbide. They are built without a strainer, although Monel metal screen strainers can be supplied. Unusual part of the design is the core or spinner, which floats in

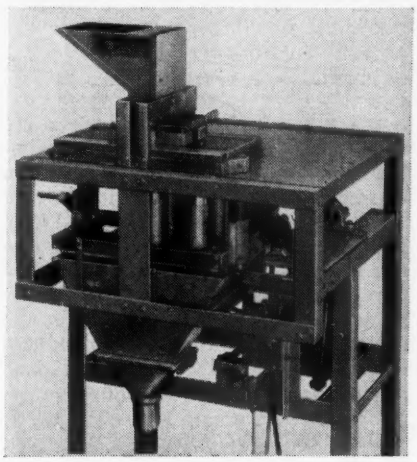


Lift truck, powered by 6 hp. gasoline engine, has mobility of rolling ball in a saucer.

the cap of the nozzle. When in operation the pressure of the liquid rigidly holds the core in position. The purpose of the floating core is to simplify possible cleaning as well as replacement.

Volumetric Filler

A NEW type volumetric filling machine, the Triangle Rapp-Id-Filler, for packaging free-flowing dry products into various style containers, is available in two models, with maximum speeds of 80 and 120 discharges per minute. Uses include packaging rice, beans, peas, nutmeats, hard candies, grocery staples, and other free-flowing products into containers ranging in size from a few ounces to several pounds. Filling cups are adjustable telescoping type. They may be emptied into a common discharge hopper or into individual discharge hoppers, depending on the size of the



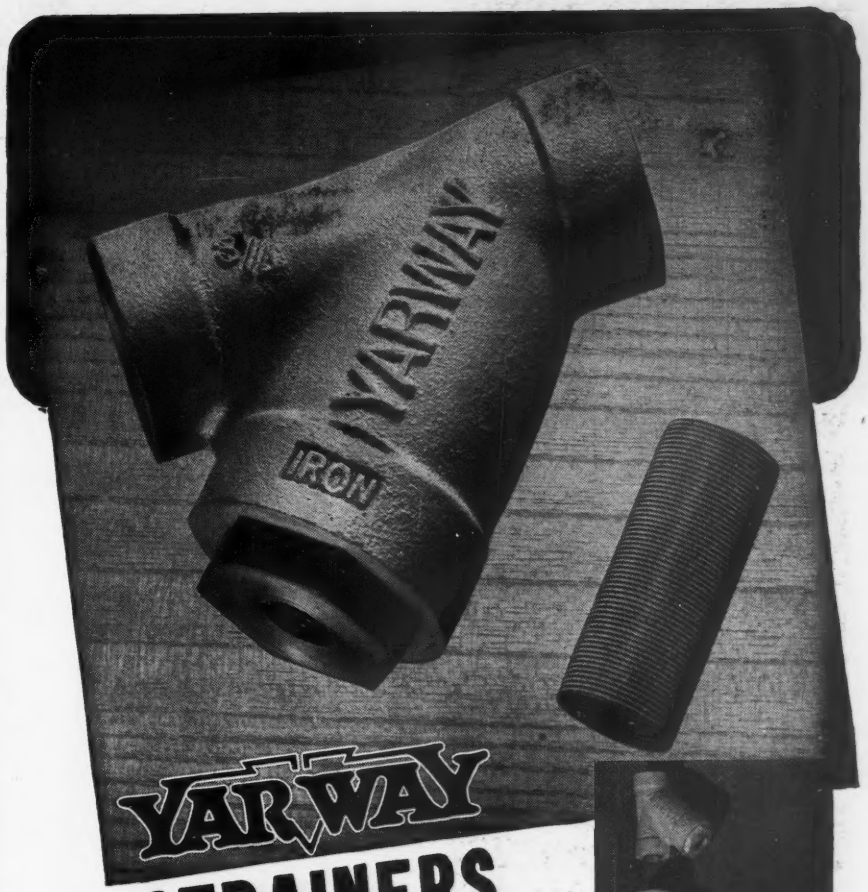
Volumetric filler for free-flowing products.

package and the production desired. Operating principle of both models is identical, the only difference being the number of filling cups. The Rapp-Id-Filler is manufactured by the Triangle Package Machinery Co., Dept. I, 906 No. Spaulding Ave., Chicago 51, Ill.

Tachometer

A NEW switchboard tachometer having five heads and three speed ranges has been made available by the Metron Instrument Co., Dept. I, 432 Lincoln St., Denver, Colo. This instrument has permanently mounted tachometer heads at five different machines. There is a rotary selector switch on the indicating unit for selecting the machine to be measured for speed. The machines may be remote from the location of the indicating unit; in fact they may even be in different buildings and the indicating unit may be located in the superintendent's office.

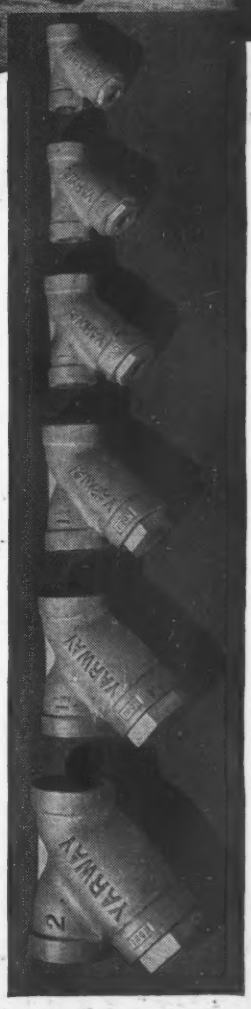
The scale of this tachometer shows three different speed ranges between 1 r.p.m. full scale and 50,000 r.p.m. full scale. A rotary selector switch is mounted on the panel of the indicating unit for selecting the proper



YARWAY

STRAINERS

"Police the Pipelines"



YARWAY STRAINERS are *selling by the thousands* because they are better engineered for the service.

"*The Screen is the Thing*"—a high-grade, woven Monel wire screen that stops the dirt, lets fluids flow freely.

Then, too, purchasers like the *body finish*—*Cadmium plated* for protection against corrosion and for better appearance.

And last but not least, it is "*Easy to Clean*" having a steel blow-off bushing, precision machined with straight thread. Screen and bushing come out together—go back together, automatically aligning.

Six sizes, ½" to 2" for pressures up to 600 lb serve practically all strainer needs.

Sold by over 100 Mill Supply Houses. See your Supply House or write for Bulletin S-201.

YARNALL-WARING COMPANY
127 Mermaid Avenue PHILADELPHIA 18, PA.

YARWAY STRAINERS

For industries whose nature requires a disinfectant with unusual bactericidal powers *plus* lack of odor, Teramine is the *perfect solution.* This fully tested and guaranteed* disinfectant provides a phenol coefficiency of "10" against EB. Typhosa and of "15" against Staphylococcus Aureus (pus germs). Storing or freezing does not lessen Teramine's lethal potency. And it's economical too—you use only 1 ounce to 1 gallon of water.

Consult one of the 350 West representatives. You'll find their guidance invaluable.

**As tested by the F. D. A. Method of the U. S. Department of Agriculture—circular 198.*

Products That Promote Sanitation

WEST DISINFECTING Company

42-16 WEST STREET
LONG ISLAND CITY 1, N. Y.

★ BRANCHES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

CLEANSING DISINFECTANTS • INSECTICIDES • KOTEX VENDING MACHINES
PAPER TOWELS • AUTOMATIC DEODORIZING APPLIANCES • LIQUID SOAPS

Multi-range, multi-head tachometer.

speed range These instruments are available in either box type switchboard units for mounting on the front of the switchboard or wall, or in the flush switchboard type.

Fumigation Chamber

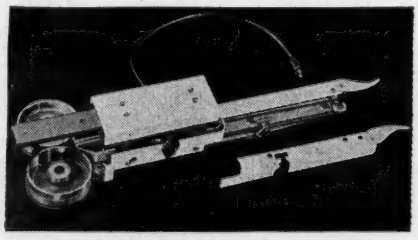
A FUMIGATION chamber, developed for and used widely by the Army during the war, that should find application in food processing industries is sold by Docona Associates, Dept. I, Glen Ridge, N. J. Articles to be fumigated are placed on a truck which is rolled into the chamber. This permits dispersement of the fumigant under the material. The fumigant is introduced through a special injector unit and circulated by means of a blower.

Gas Scalder

SCALDING as high as 1,000 chickens per hour, the Greenbrier automatic scalder, sold by the Greenbrier Co., Dept. I, 1783 E. 11th St., Cleveland, Ohio, can keep 3 picking machines busy. After sticking, the birds are placed in a metal cage. The cage door when closed locks shut automatically. The cage rotates 20 to 45 sec. for chickens and turkeys, 3 min. for ducks. Stopping in an upright position the birds are removed together or individually. Two gun-type gas burners, thermostatically controlled, provide temperatures for slack, semi-slack or hand scalding.

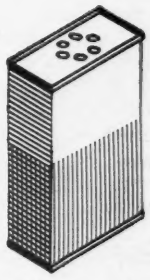
Conveyor Feed

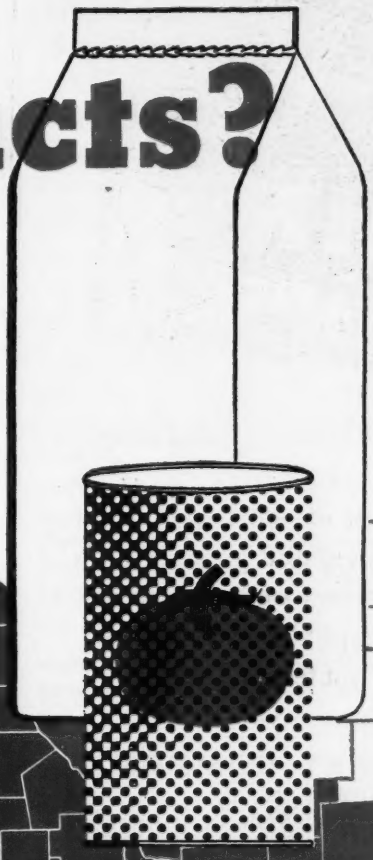
A SPRING-LOADED bag or pouch conveyor-feed attachment for their rotary sealer has been introduced by Pack-Rite Machines, Dept. I, 714 W. Wis-

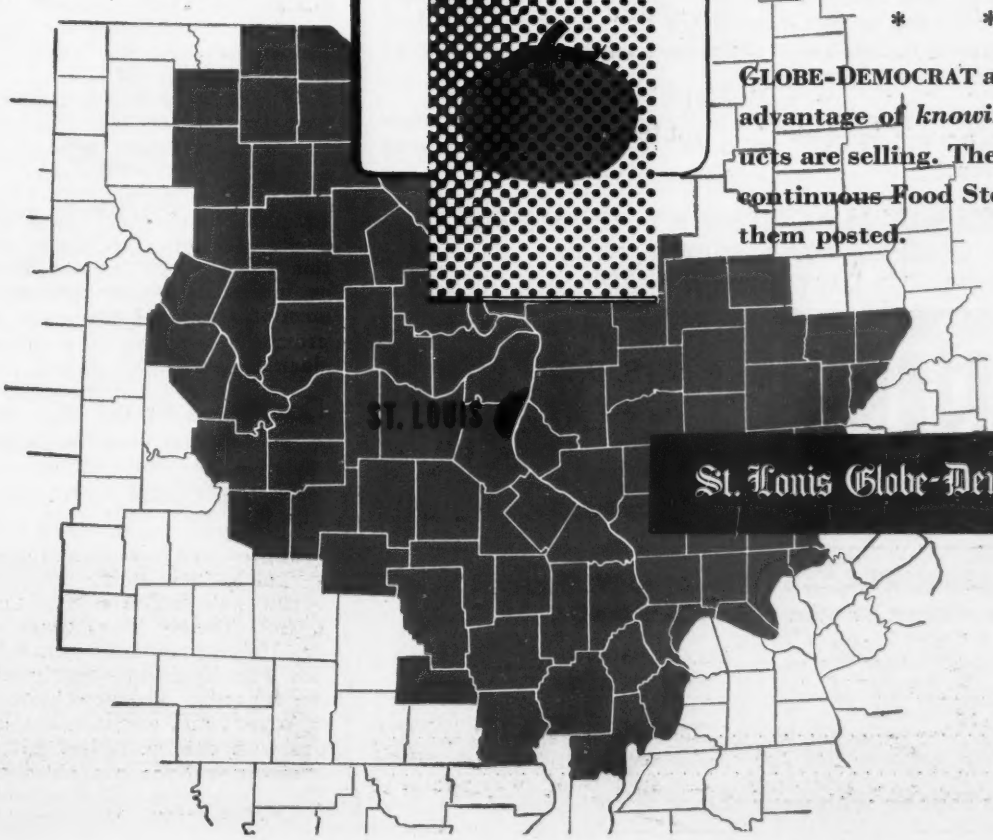


Spring-loaded bag conveyor-feed.

Selling Grocery Products?







You really have to cover ground to cover this market

Reaching St. Louis is only half the job of reaching the rich St. Louis *market*. You've got to get out to the outskirts, too.

More than half the population of this massive midwest market . . . and 4616 of its 6987 grocery stores . . . are *outside* St. Louis' city limits.

But there's *one* way to cover the *entire* market. Come along in the St. Louis GLOBE-DEMOCRAT . . . it puts your advertising on breakfast tables all over St. Louis *and* in 87 surrounding counties in eastern Missouri and southern Illinois!

The GLOBE-DEMOCRAT is the *only* daily that *even claims* to cover this billion-dollar area successfully.

* * *

GLOBE-DEMOCRAT advertisers have the advantage of *knowing* how their products are selling. The GLOBE-DEMOCRAT continuous Food Store Inventory keeps them posted.

St. Louis Globe-Democrat

This new Book contains everything you want to know about pulverizing

Send for your copy today

This valuable 48-page illustrated book tells you how to produce fine and ultra-fine powders; how to test the value of fine and ultra-fine grinding right in your own laboratory or pilot plant before starting full production schedules; how to obtain accurate control of particle size, blending and dispersion; how to select the proper mechanical pulverizer for your needs.

Send for this catalog today and learn why it is decidedly to your advantage to use a MIKRO-PULVERIZER or a MIKRO-ATOMIZER in your pulverizing operation.

PULVERIZING MACHINERY COMPANY
97 CHATHAM ROAD, SUMMIT, N. J.
NOW . . . 2 TYPES TO MEET MOST PULVERIZING NEEDS

MIKRO-PULVERIZER (FINE) -ATOMIZER (ULTRA FINE)
Reg. U. S. Pat. Off.

PULVERIZING MACHINERY CO., 97 Chatham Rd., Summit, N. J.
Please send me a copy of your new illustrated catalog.

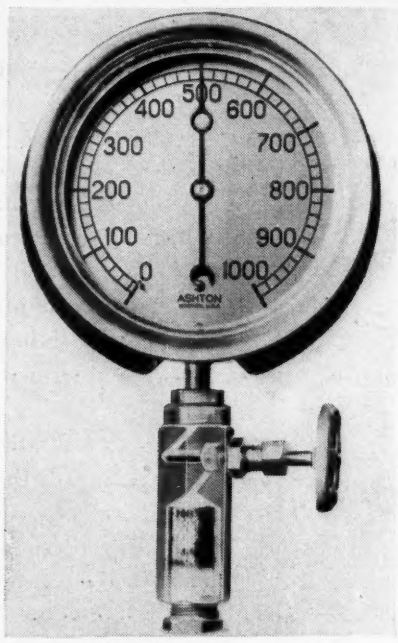
Name ..... *Position* .....
Company .....
Company Address .....
City ..... *State* .....

Mail this coupon with your company letterhead

consin Ave., Milwaukee 1, Wis. When fed into the attachment, special springs take hold of the bags and convey them through a preheater unit and sealing rollers at a speed of 300 in. per min. Only tiny point contact is required to convey bags, thus eliminating slack-fill. Easily installed on Fast-Tite rotary sealers now in use.

Pulsation Dampener

AN improved pulsation dampener for gages and governor, with an estimated life of 100 years, is being pro duced by J. A. Campbell Co., Dept. I, 645 East Wardlow Road, Long Beach 7, Calif. It is available in all-brass and all-steel with stainless steel stem. No piston is required. Temperature has no effect on the viscosity and surface tension of liquids within the line. To overcome scoring, Campbell has provided a screw, which, when turned slightly, will bring back the seating to



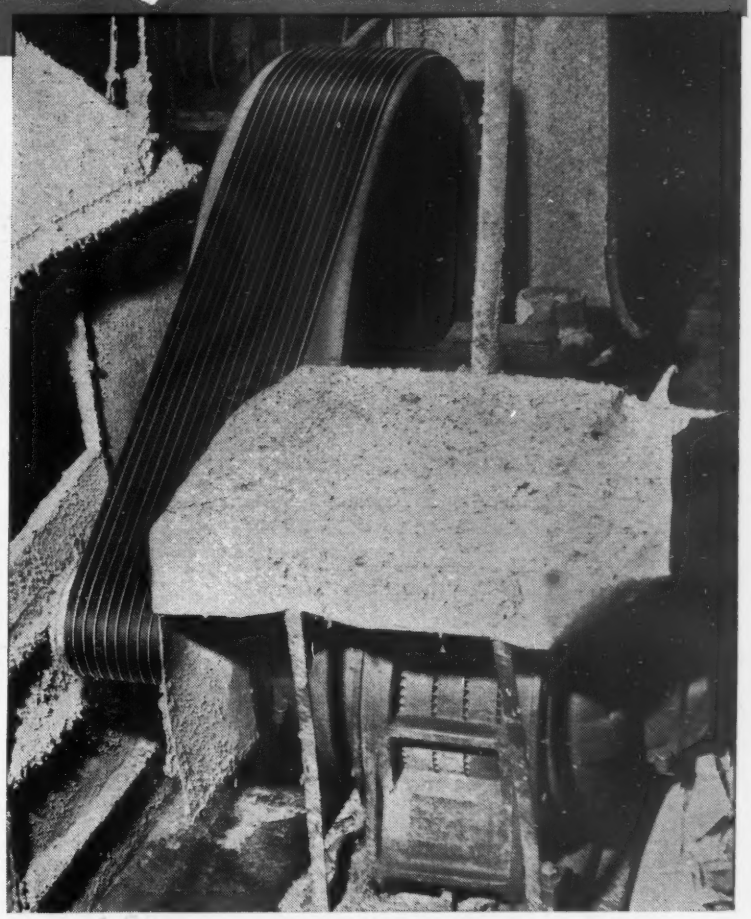
Pulsation dampener for gages.

perfect control. This can be repeated every two years or so. When the micro-plug eventually becomes scored, after an estimated ten years of service, the scores can be eradicated by merely opening and closing the valve tightly about ten times. The principal purpose of the Micro-Beam is to eliminate jitters in the gages.

Two-ton Hoist

A MODEL with a capacity of 2 tons has now been added to the Midget King line of electric hoists manufactured by the Yale & Towne Mfg. Co., Dept. I, 4530 Tacony St., Philadelphia 24, Pa. Hoists previously included in this line were made in sizes from ½ to 1 ton capacity. The new hoist is light in weight and compact, but is equipped with a 1 hp. motor. Lifting and lowering actions are obtained by a flip of the wrist on the one-hand bar grip control. The hoist operator thus

WHY DAYTON V-BELTS *Eliminate Vibration*



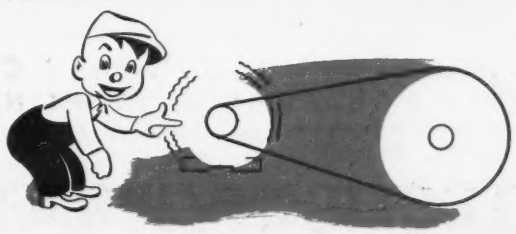
NO VIBRATION! NO BREAKDOWNS!
in 12 years of beating paper into pulp

In the plant of a large eastern boxboard mill, five huge beaters reduce old cardboard and corrugated paper into pulp. It's a rough, dusty, tough job. The first of these five beaters, installed over 12 years ago, was equipped with a drive that frequently broke due to excessive vibration and shock-starts and stops. Something had to be done. A Dayton V-Flat Drive was installed, using the original large flat pulley. Smooth starting and stopping and absence of vibration immediately put an end to breakdowns and reduced machine maintenance to a minimum. Naturally, as *new* beaters were installed they were all equipped with Dayton V-Belt Drives.

Dayton V-Belts eliminate vibration because their engineered resilience and the smooth, easy way they seat themselves in the pulley grooves absorbs any motor or machine vibration, or sudden jerks or jars caused by an uneven load condition. Elimination of vibration is one of many reasons why Dayton V-Belts can help you solve your power transmission drive problems efficiently and economically. Your Dayton Distributor will gladly tell you the full story. Call him today.

THE DAYTON RUBBER MANUFACTURING COMPANY
DAYTON 1, OHIO

Branch Offices: Atlanta • Boston • Chicago • Cleveland Cincinnati • Dallas • Dayton • Detroit • Los Angeles Minneapolis • New York • Philadelphia • St. Louis



The shocks of suddenly applied power are absorbed by Dayton V-Belts seating themselves further down in the pulley grooves. Any motor or machine vibration is absorbed by the engineered resilience of Dayton V-Belts.

V-BELT BUYERS! A leading mill supply house near you stocks Dayton V-Belts... Look for the name in the yellow pages of your telephone directory

Dayton Rubber

THE NAME OF TECHNICAL EXCELLENCE IN NATURAL AND SYNTHETIC RUBBER

THE WORLD'S LARGEST MANUFACTURER OF V-BELTS

AS QUICK AS A FLASH YOU CAN KNOW THE EXACT MEASUREMENT OF YOUR VALUABLE STORED LIQUIDS With LIQUIDOMETER Tank Gauges

WRITE for COMPLETE DETAILS

"LIQUIDS WORTH STORING ARE WORTH MEASURING"

THE LIQUIDOMETER CORP.
38-14 SKILLMAN AVE., LONG ISLAND CITY, N.Y.

NOT this—

but THIS!

SYNTRON
"Pulsating Magnet"

ELECTRIC VIBRATORS

makes stubborn materials flow freely thru

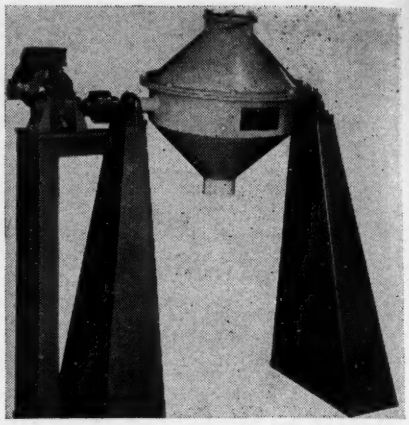
bins, hoppers and chutes

Powerful, pulsating electromagnets that break down arching and plugging.

Send us a description of your problem—thickness of hopper walls, etc.—we'll be glad to submit a recommendation or—

Write for illustrated folder.

SYNTRON CO., 460 Lexington, Homer City, Pa.



Cone blender for use in food industries.

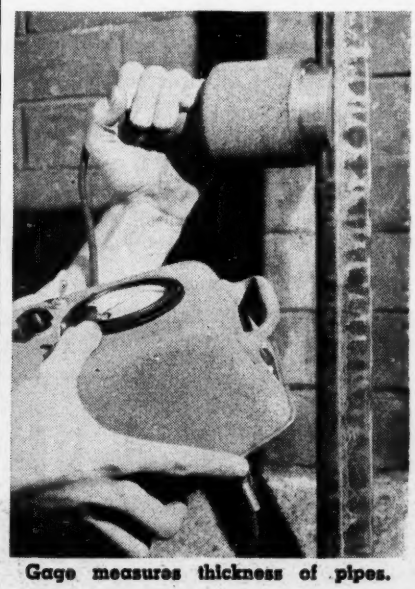
has his other hand free to guide the load. The hoist is provided with upper and lower safety limit stops and a load brake and independent motor brake which operate whether the power is on or off. Alloy steel is used for all critical parts.

Cone Blenders

CONE blenders, fabricated in various grades of stainless steel especially for use in the food industries, are made by H. K. Porter Co., Inc., Dept. I, Oliver Building, Pittsburgh, Pa. In sizes that range from 12 in. to 10 ft. in diameter, driven by motors of ¾ to 100 hp., these blenders will handle materials that weigh from 25 to 125 lb. per cu. ft. Drive and blender are mounted in one unit on long fabricated supports that eliminate the need for concrete pedestals. Quick opening clamps are used on charging doors. Discharge openings are of the butterfly dust type valve.

Thickness Gage

A GAGE designed to measure the thickness of iron or steel pipes from the outside has been announced by the General Electric Co., Dept. I, Schenectady, N. Y. It can be used on pipes up to ¼ in. thick and from 1 to



Gage measures thickness of pipes.

Yummy!

CHILDREN like things to eat that taste *good*. And so do grown ups. They prefer a certain brand of food because it tastes better.

That's why it's so important for food manufacturers to safeguard food flavor—and for this purpose nothing equals Stainless Steel.

It is because Stainless Steel is chemically inert in the presence of meats, vegetables, fruit juices and dairy products, because it imparts no foreign taste or odor, and leaves color unaffected, that Stainless Steel has made possible the better control of natural flavor that makes food sell better.

But U·S·S Stainless does more than protect wholesomeness and purity. Food processing equipment made of U·S·S Stainless will safely withstand extremes of heat and pressure . . . is strong to resist abuse and hard service . . . can easily be kept spotlessly clean . . . offers lasting immunity to stain, tarnish and corrosion.

These advantages, found at their best in service-tested U·S·S Stainless Steel, pay off in longer life, reduced maintenance costs, and greater flexibility in the use of equipment. All are reflected not only in a product that tastes better and sells easier, but that costs less per unit to produce.

Remember-nothing equals Stainless Steel-especially if it's...

U·S·S STAINLESS STEEL

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
NATIONAL TUBE COMPANY, *Pittsburgh*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
United States Steel Supply Company, Chicago, *Warehouse Distributors*
United States Steel Export Company, New York 7-39

USS STAINLESS STEEL UNITED STATES STEEL

UNITED STATES STEEL

Watch this Electric Hoist cut handling costs

SEE the speedy Meteor in action and you'll agree that materials handling costs are down for the full count. This heavy duty electric hoist is an outstanding performer . . . a time and money saver. Helical gears, airplane type cooling, low headroom, thermal protection, only 110 volts at push button station . . . and speed . . . are but a few of the Meteor's notable features. Bulletin 142 will tell you about all of them. Better still, the Meteor itself will bring you all of them.

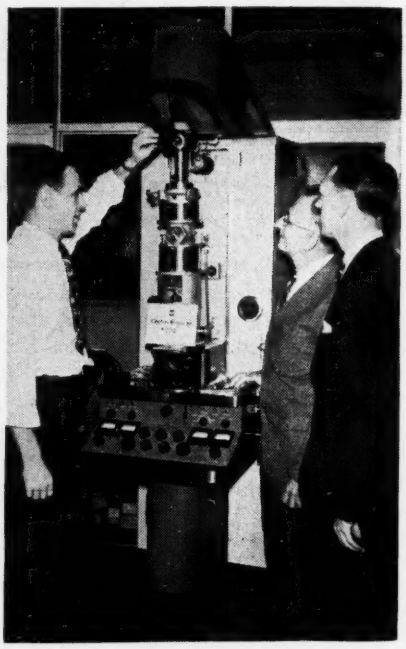
Capacities from ½ ton and up. Lifting speeds from 18 to 60 feet per minute.

CHISHOLM-MOORE
HOIST CORPORATION
(Affiliated with Columbus McKinnon Chain Corporation)
GENERAL OFFICES AND FACTORIES: TONAWANDA, N. Y.
SALES OFFICES: New York • Chicago • Cleveland • San Francisco • Los Angeles

2 in. in diameter. The gage consists of an indicating instrument, a gage head and a saddle which is connected with the gage head by two screws. To operate, the saddle is placed upon the pipe, and thickness is indicated in fractions of an inch. Accuracy of ± 1/64 in. can be obtained on clean surfaces, and 1/32 in. on dirty surfaces. The combination weighs 6½ lb. and operates on 115 v., 60-cycle power.

Electron Microscope

To provide production specialists and research workers with a compact, easily operated super-magnifier for studying the size, shape and structure of particles too small to be seen by other means, Radio Corp. of America, Victor Division, Dept. I, Camden, N. J., has made available the RCA electron microscope. There are two



Electronic eye magnifies 100,000 times.

magnification positions: 500 X and 5000 X. A built-in camera makes it a simple matter to take good micrographs which can be enlarged to 100,000 diameters. Comes in two models, the Universal and the console type.

Level Control

THE TRIMOUNT INSTRUMENT CO., Dept. I, 37 W. Van Buren St., Chicago 5, Ill., announces a new electronic level control for controlling high, low and intermediate levels of liquids and conducting solids in open or closed tanks.

This unit has a sensitive conductance control, which is adjustable to conductivity of a specific substance and is not affected by foam or foreign matter on top of the liquid. It is applicable for controlling levels in caustics, acids, paints, food products, milk, water, chemicals and other substances and will operate efficiently under extremes of temperature and pressure.

CATALOGS, BULLETINS

This digest of manufacturers' new publications is offered by FOOD INDUSTRIES Readers' Service as a convenience for executives. To obtain this literature, fill in the coupon, clip to your letterhead, and mail to FOOD INDUSTRIES.

Food Plant Equipment

Stainless Steel Fittings 1
John B. Astell & Co., Inc.—Folder showing stainless steel pipe, tubing, and fittings. Contains a table of the chemical composition of stainless steels and a cross-sectional view of the new Ermeto fitting illustrating how a positive seal is formed without flaring, threading, welding or soldering of pipe or tubing.

Pumps 2
Economy Pumps, Inc.—An 8-page catalog No. C746 dealing with DMD ball bearing two-stage pumps. Contains illustrations and detail drawings of pumps. Also performance curves and selection tables.

Condensers 3
"Steam Condensers" is the title of a 43-page catalog No. 1461 recently issued by C. H. Wheeler Mfg. Co. Contains illustrations of various types and sizes of surface condensers, and jet condensers of both low level and barometric type. Also graphs, conversion tables and logarithms.

Grinding Mill 4
Morehouse Industries—4-page folder describing the advantages and outstanding features of this firm's new model high-capacity SB 1400 Hy-R-Speed mill for grinding, emulsifying, homogenizing, mixing, dispersing and disintegrating. Gives dimensions and cross sectional views.

Work Table and Conveyor 5
An 8-page bulletin—PF-8, featuring an all-purpose conveyor, mechanized work table for assembly, inspection and packing operations, is issued by Island Equipment Corp. Contains illustrations of installations, cross sections and parts of the equipment. Also a page of specifications.

Homogenizer 6
A. T. Case Co.—4-page illustrated sheet describing outstanding features and applications of this firm's emulsifier-homogenizer in the chemical, paint and varnish, petroleum, pharmaceutical and other industries.

Heat Exchangers 7
Southwestern Engineering Co.—Bulletin No. 403. 12-page illustrated booklet describing the heat exchanger manufactured by this company. Contains information on long tube heat exchangers, reboilers, and short tube heat exchangers. It is well illustrated with photographs of the various types of equipment.

Couplings 8
Farrel-Birmingham Co., Inc.—Bulletin 447 contains 46 pages and describes various types of couplings for use in industrial and marine service. Gives description of coupling functions, plus recommendations of the correct types for specific applications. Contains engineering data with ratings, dimensions and weights.

Dust Collectors 9
American Foundry Equipment Co.—Bulletin No. 112 describing American Dustube Dust Collectors available in three models, with capacities from 270 C.F.M. up.

Exhaust Fans 10
A 12-page bulletin No. 1102 on Duroo corrosion-resistant fans for exhausting fumes has just been published by the Duriron Co. This bulletin gives complete engineering data, including dimensions and capacities of the five standard sizes of fans made by the company. Some of the typical applications for the fans are shown by drawings.

Fluid Drive 11
Link-Belt Co.—Bulletin 2085. 16-page illustrated booklet describing the Electro-fluid drive packaged power unit for use in industry. Construction details are shown by cutaway views, and rating, and dimensions are tabulated.

Lighting 12
Nine types of reflector lamps for industrial, commercial, store, theatre and display lighting are illustrated in bulletin No. 101, "A Better Kind of Lighting," issued by Lustra Corporation of America. Included are neck-silvered directs and concentrators, side-silvered tubulars and various floodlites, spotlites, and super-spotlites.

Pipe Conduits 13
H. W. Porter & Co.—Bulletin No. 461. 4 pages, two colors, illustrating and giving up-to-date description of Therm-O-Tile. One portion relates to waterproofing of Therm-O-Tile for submerged conditions.

Joints 14
The Johnson Corp.—26-page catalog J completely describes the construction, application and operation of the Johnson Joint used in connection with all types of rotary, drying and cooling rolls. Contains illustrations, line drawings, dimensions and prices.

Chain Hoist 15
Chester Hoist Co.—16-page bulletin in two colors, covering complete line of spur gear and differential chain hoists, together with their army type low headroom Timken equipped trolley hoists. It is filled with tables, section and photographic views of the various products, including a complete line of I-beam trolleys.

Piping Equipment 16
Chicago Metal Hose Corp.—New booklet featuring the compensator manufactured by this company for absorbing motion inherent in general pipeline applications. Contains diagram of typical compensator applications and installations, gives data on compensator working pressures and standard fittings, and contains other information.

Refrigeration Plant 17
"Freezing Temperatures Made to Order," is the title of an 8-page color booklet on refrigeration plants released by Caterpillar Tractor Co. The bulletin—Form 9783—is packed with brief stories and action photographs pertinent to its title.

Displacement Meters 18
Positive Displacement Meters are the subject of Bulletin 40-B-14 recently issued by Roots-Connersville Blower Corp. This 16-page booklet is illustrated with halftones of shop and installation views, sectional drawing, and proof curves of meter tests. Construction features are discussed and a table of sizes and capacities is included.

Materials Handling

Materials Handling 19
Albert H. Cayne—48-page booklet illustrating and describing the materials handling equipment such as conveyors, hand-trucks, lift trucks, etc. Also several leaflets covering such equipment as gravity conveyors, hoists, belt-conveyors, dollies, hand trucks, etc.

Conveyors 20
"Off the Shelf Service" is the name of the general catalog issued by the Patron Transmission Co., describing many nationally known lines of speed reducers, gears, belts, chain drives, bearings, flexible couplings, pulleys, electric motors, power and gravity conveyors. Data and prices are included on each item.

Trailers 21
Dorsey Trailers—General catalog "The Dorsey Line" contains illustrations, descriptions, specifications and prices of Dorsey trailers, vans and Z*RO Transports for frozen food products. Also price lists and a 6-page questionnaire covering Z*RO Transport.

Conveyors 22
Rapids-Standard Co., Inc.—Single-page, double-sided bulletin describing the Rapid-Wheel gravity conveyor spur curve and the Rapid-Wheel gravity conveyor hinged section, and their uses in a Rapid-Wheel conveyor installation. Includes list prices and specifications of each.

Power-driven Conveyor 23
E. C. Horne Machinery Co.—Bulletin 100. 4-page folder giving the specifications, outstanding features and industrial applications of a new portable, flexible and reversible power-driven conveyor that can operate around curves. Illustrated with photographic reproductions and line drawings.

Loading Systems 24
The Freight Loading and Container Section of the Association of American Railroads has just published "Progress Report of Glued Unit Loading System," General Information Series 506. This re-

Good until May, 1947

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FOOD INDUSTRIES, 330 W. 42nd St., New York City 18

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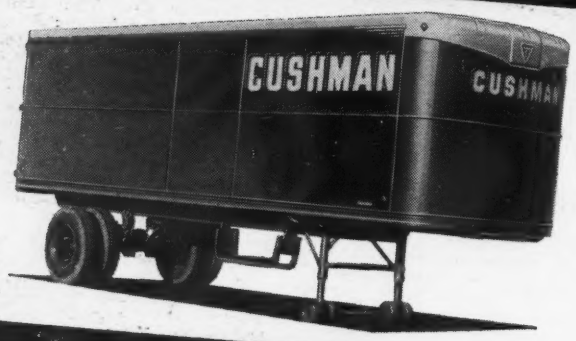
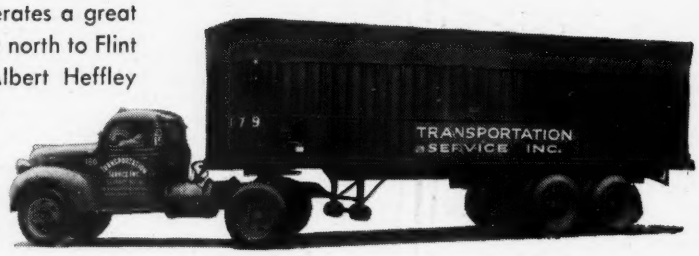


Cushman Motor Delivery Company of Chicago, one of the oldest and best known motor carriers in the country, operates over 200 trailers which serve six mid-western States. Barney Cushman, President, said: "We especially like Trailmobile's lightness of weight and rugged strength. Furthermore, the locking device on the rear door is another fine feature."

Transportation Service, Inc., operates a great fleet of trailers which fan out of Detroit north to Flint and south to Cincinnati. President Albert Heffley stated enthusiastically that on the basis of Trailmobile's strength, construction, trouble-free performance and low maintenance cost his organization finds it to be an excellent buy.



Craig Trucking, Inc., Albany, Indiana, serves the States of Indiana, Ohio, Michigan, Illinois and the border cities of Pittsburgh, Louisville and St. Louis. Mr. Keith Craig declared that Trailmobile's low maintenance, rugged long-life, and splendid Branch Service definitely makes it the top transportation investment.

AMONG TRAILER USERS EVERYWHERE

The Trend is to TRAILMOBILE

Today, trailer users everywhere are swinging to Trailmobile. But we wanted to know why—in their own words! So we asked scores of them, hauling all kinds of loads, in all sections of the country.

They told us exactly what Trailmobile's advanced engineering and major structural improvements mean to them in terms of low-cost, efficient hauling. They told us too, about the value to them of Trailmobile's company policies, and our expanded nation-wide network of 73 Customer Service Centers.

On this page you will find typical answers. For more and detailed evidence of the reasons why The Trend Is To Trailmobile —just reach for your telephone and dial your nearby Branch.

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WE are eager to have your firm as one of our many clients and will be glad to advise you (without obligation on your part) as to how we can assist you in many matters requiring the work of an independent laboratory of established reputation and broad experience.

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REPRESENTED IN PRINCIPAL CITIES

port contains instructions on methods of glue application as well as typical installations of glue applicators to roller or skate wheel conveyors. Methods for carloading fiber boxes by this system are recommended.

Pulleys and Brakes 25
Stearns Magnetic Mfg. Co.—Catalog 303 on magnetic pulleys. Contains descriptive data, specifications, information on selecting for proper size, material, capacities, trajectory charts, use of double magnetic pulleys as well as application suggestions and pictures. Catalog 604 D, a text book on magnetic brakes for floor, motor and machine mounting. Contains complete data, specifications, forms for mounting of brakes, general application information and pictures.

Plant Supplies

Building Materials 26
Hill Bros. Chemical Co.—34-page catalog listing properties, specifications and prices of this firm's line of building material specialties, including plastic magnesite, asbestos, oxychloride cement colors, flexible plaster, oxychloride cement, calcium chloride and clay materials. Gives detailed illustrations for preparation and applications.

Chlorine Tablets 27
The Universal Chlorinator Co.—Bulletin No. 10 describing Uni-Chlor tablets. Contains tables showing effectiveness of Uni-Chlor in sanitizing tumblers. Also paragraphs on general description, physical characteristics and applications.

Baskets 28
Saranac Machine Co.—Bulletin 111, "The Modern Manufacture of Baskets"—8 pages illustrating machinery for manufacture of hamper baskets, together with specifications of machines. Bulletin 129 illustrates machinery for applying Hawkins handles to baskets. Bulletin 130 illustrates bushel cover machines. Bulletin 132 illustrates Saranac automatic hoop coilers.

Water Conditioning 29
Modern methods and apparatus for conditioning water and other liquids are described in a 60-page bulletin G, just completed by Liquid Conditioning Corporation. Bulletin describes the many different types of water-conditioning processes, explains the application, advantages and limitations of each type. Several tables and charts relating to water treatment add to its usefulness.

Fungicides 30
Ferro Chemical Corp.—"Ferro Fungicide," 22-page Technical Bulletin No. 12. Contains sections on "Marketing Fungicides;" "Destructive Agents;" "Naphthenates as Water Repellent Fungicides;" "Ferro Fungicides—Their Properties;" "Suggested Basic Retail Formulations Based on Ferro Fungicides;" "Product Control;" "Biological Data;" "General Bibliography."

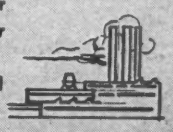
Insulation 31
A 20-page manual for process engineers and power men, entitled "Control of Industrial Heat and Power Losses," has been issued by the Industrial Mineral Wool Institute. Nine case histories, illustrated and described in full detail, cover a variety of typical situations in which piping, flanges, drum-heads, driers, boilers, and other heated surfaces were figuratively dripping with wasted fuel-dollars until proper insulation confined them.

Water Conditioning 32
A 12-page instruction booklet, entitled "Allis-Chalmers Water Conditioning Chemicals and Equipment," written for the guidance of power plant operators, has been announced by the Allis-Chalmers

The Zenith Pulp Press, with capacity up to 26 tons per hour, thoroughly dewaters wet pulps and slurries such as:
Beet Pulp • Citrus Wastes • Tomato Pomace • Cherries • Corn Fibre • Paper Pulp • Reclaimed Rubber, etc.

Heavy screw-type spindle applies smooth, continuous pressure, forces pulp or slurry against selective resistance. Rifle drilled resistors permit use of steam when necessary. Minutely perforated screens assure efficient drainage, hold pulp losses to minimum. Ball thrust bearings and oversize shaft bearings reduce power load.

New uses for the remarkably efficient, profitable Zenith Pulp Press are being constantly developed. An experimental press is available for trial in your plant.



Write for full information.

JACKSON & CHURCH CO.
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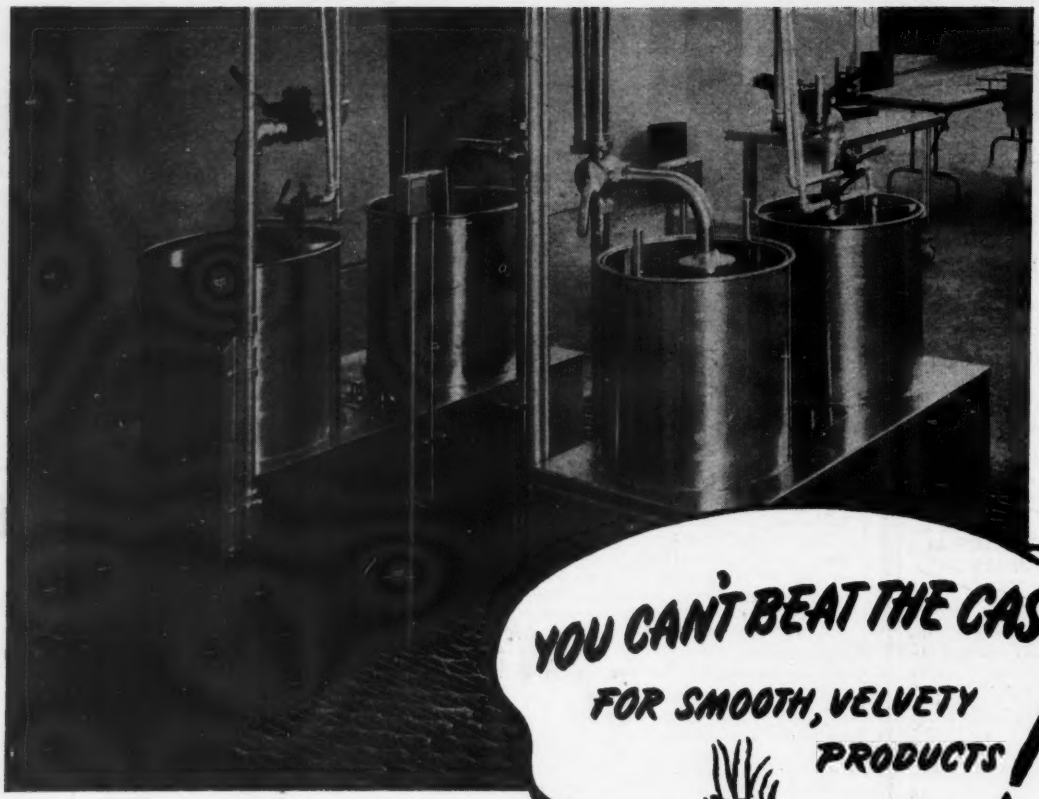

THERE'S a smooth, velvety texture to foods mixed by the Case Emulsifier-Homogenizer that is truly unsurpassed. Uniform firmness and high stability, are characteristics of Case processed products.

This perfect mix, or emulsification, is achieved by the novel and patented Case dispersion devices. No pre-mixing; beating or stirring. Liquids are piped from storage tanks into individual compartments of the supply tank. The ingredients then rapidly flow, under control of the operator, into the patented Case emulsifying-homogenizing devices. Forced flow of combined ingredients, progressively dispersed, are cycled and recycled until the predetermined end product is produced.

You not only obtain superior products, but save time, labor and costs.

Use the Case Emulsifier-Homogenizer for such products as:

A Few Food Industry Uses:

Mayonnaise	*Sauces*	*Flavorings*
Dressings	*Toppings*	*Extracts*
Spreads	*Icings*	*Infants' Foods*
Peanut Mixes	*Mustard*	*Ice Cream Premixes*

A·T·CASE·CO·

EMULSIFIER-HOMOGENIZER

MONROVIA, CALIFORNIA

Mfg. Co. The booklet touches upon the importance of feedwater control, the care of testing equipment, obtaining samples, and test procedures. Carries handy reference tables to assist in reporting results.

Control Equipment

Recorders and Indicators 33
The Bristol Co.—Bulletin No. S1400, describing its line of tachometer recorders and indicators. The 12-page bulletin includes a complete description of the Pyromaster potentiometer-type tachometer, the millivoltmeter-type indicator, and a strip-chart recording tachometer. Complete wiring diagrams, application data and accessory information are given, including illustration of a typical installation.

Flow Rate Meters 34
Fischer & Porter Co.—Bulletin 40-A describes completely armored, variable-area flow rate meters, designed specifically for use where high pressures, high-temperatures, possibility of liquid hammer or handling of hazardous gases or liquids makes the use of Rotameters with exposed glass tubes dangerous and impractical.

Control Equipment 35
Bulletin No. 1200 issued by Proportioneers, Inc. is a handy reference book containing material dealing with automatic flow responsive equipment and methods in continuous process operation. Photographs of typical installations are supplemented by flow diagrams and detail drawings.

Remote Transmission 36
The Brown Instrument Co.—24-page catalog No. 5902 describing New-Matic Remote Transmission Systems applicable where electrical transmission for indicating, recording and control of temperature, pressure, flow and liquid level is neither desirable nor permissible. A section of the catalog is devoted to accessories used in this system.

Miscellaneous

Carbon Monoxide Alarm 37
The M.S.A. carbon monoxide alarm, designed for efficient protection against dangerous concentrations of carbon monoxide in the air, is featured in a 4-page bulletin No. DR-3, published by Mine Safety Appliances Co. Contains illustrations and a complete description of the ventilation control.

Degreasers 38
Mechanical Process Co.—7-page bulletin "D'Oiler" contains specifications, descriptions and illustrations of the different types of D'Oilers for cleaning and degreasing jobs.

Resistance Welding 39
Ampco Metals, Inc.—Bulletin 68A includes diagrams and information covering a new line of water-cooled electrode holders. A large selection of spot welder tips is offered, and the list of seam-welder wheels has been greatly enlarged.

Car Doorway Bracing 40
A 4-page, illustrated booklet, "Doc Steelstrap," by Acme Steel Co., gives an up-to-date demonstration in print on the safe economical way to brace car doorways. Photos of proper tools and accessories, plus location of Acme Service Centers are included.

Production Engineering 41
Production Decalog, a 40-page brochure by George Fry & Associates, discusses the ten elements of an efficient production engineering program.

Fire Prevention 42
The National Board of Fire Underwriters.—44-page booklet entitled "Fires That Never Happen." Contains information on organized fire prevention work during the war.

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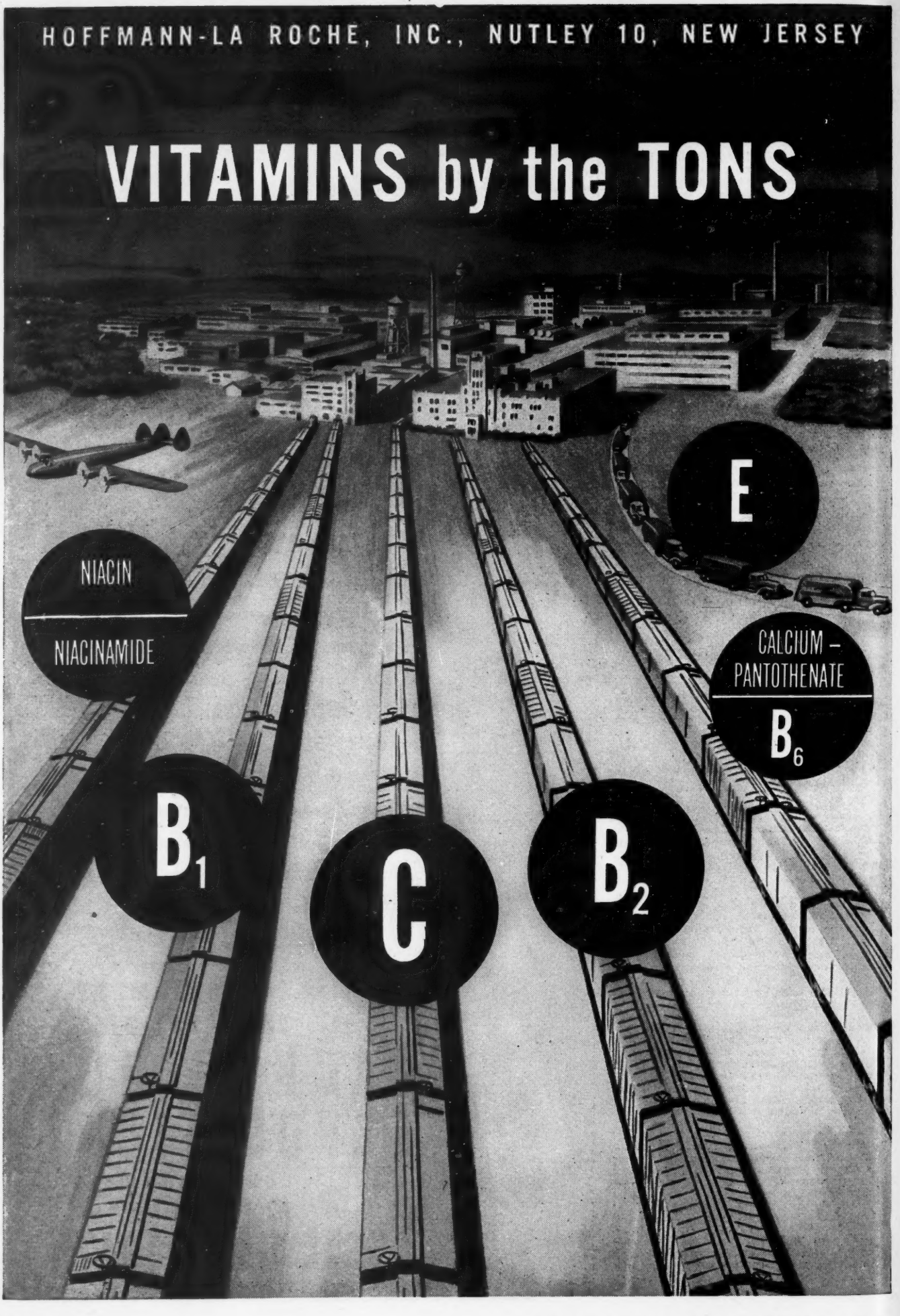
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FOOD TECHNOLOGY

NEW DISCOVERIES AND INVENTIONS

FRUIT PRODUCTS

Apple Flavoring

A WATER solution of apple essence, a colorless liquid that holds its flavor indefinitely without weakening or changing, has been developed in the course of research on new apple products. In a relatively simple process, the fragrant vapors rising during the heating of apple juice are condensed, concentrated from 10 to 150-fold, and dissolved in water. The flavoring thus obtained may be used in confections, ice creams and sherbets, fountain beverages and other products where a distinct fresh apple flavor is desired. Only sound apples can be used in the process. Inasmuch as most of the volatile flavor is located just under the apple skin, this part of the fruit must be damaged as little as possible in crushing for juice. Care must also be taken not to break the apple seeds as they give the product a bitter almond flavor.

Digest from "New Fruit Flavoring," from Food and Home Notes, in *"The Daily Summary,"* October 18, 1946, U. S. Department of Agriculture, Washington, D. C.

Pectin from Apple Pomace

PECTIN of low ester content has been made by a process that utilizes pectase prepared from ground ripe tomatoes. The extraction was made with apple pomace in sodium tetraphosphate solution (3 lb. of phosphate to 80 lb. of dried pomace in 150 gal, of water at 176 deg. F., adjusted to pH 3.1 with dilute H_2SO_4). The pectin extract was separated from the pomace by a hydraulic press, and concentrated in vacuo. It was assayed for pectin methyl ester, using tomato pectase as a deesterifying agent.

Tomato pectase extract, and a commercial diastase preparation, are added to the pectin extract and 2.0 normal sodium hydroxide added in calculated amount for 50 percent of the methyl ester content. The caustic is added slowly to keep the pH 6.50. When the addition is complete the pH is lowered to 4.0 with H_2SO_4, and the pectin is precipitated with alcohol.

Pectin prepared in this way analyzed 4.2 percent methoxyl and was calculated to be 33 percent esterified. When used for making calcium pectate gels, containing 1 percent pectin, it was superior to acid-deesterified pectin of similar methoxy content at pH values above 3.5.

The process requires only minor changes in the methods commonly used for apple pectin. The use of polyphosphate (tetra phosphates or hexametaphosphates) facilitates pectin extraction from apple pomace and at the same time provides a calcium-fixing agent, necessary in preparing low-ester pectins.

Digest from "Low Ester Pectin from Apple Pomace," by H. H. Mottern and C. H. Hills, *Industrial and Engineering Chemistry*, Vol. 38, No. 11, 1153-1156, Nov. 1946.

STORAGE

Temperature Variations in Air Cooled Storages

IN air-cooled storage rooms, higher than the nominal temperature of the room may exist in the interior of stacks of boxes or cases. Measurements were made in a room 16 ft. long, 13 ft. wide, 8 ft. high holding boxes, 1 x 1 x 2 ft. stacked 12 long, 5 wide and 6 high exclusive of dunnage. Thermocouples were interspersed throughout the stack. Air was circulated by a fan and delivered by a duct to the end of the stack farthest from the fan. Temperatures were observed for different stack heat loads, air flows and dunnage width, and with the voids in the room open, and blocked, so that air was forced through the stack.

Temperature measurements indicated the existence of appreciable permanent temperature gradients in the stack regardless of whether the materials were exothermic or not. The gradients can be reduced markedly by blocking the voids in the room and forcing the air to circulate through the stack. This is the most important single factor in reducing intra-stack temperature differences. Increasing the air flow, and optimum dunnage spacing (⅜ inch in the experiments described) are also important. With blocked voids, dunnage should be extended to all external stack surfaces. Uniform vertical and horizontal distribution of air flow is also desirable.

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While the measurements indicate a temperature gradient of as high as 8 or 9 deg. in the experimental stack, further trials on a larger scale will be necessary to determine additional factors affecting the gradients, and to apply the results practically.

Digest from "Reduction of Spatial Temperature Variations in Air-Cooled Storage Rooms II," by J. W. Hopkins, T. A. Steeves, and W. H. Cook, *Canadian Journal of Research*, Vol. 24, 380-95, September, 1946.

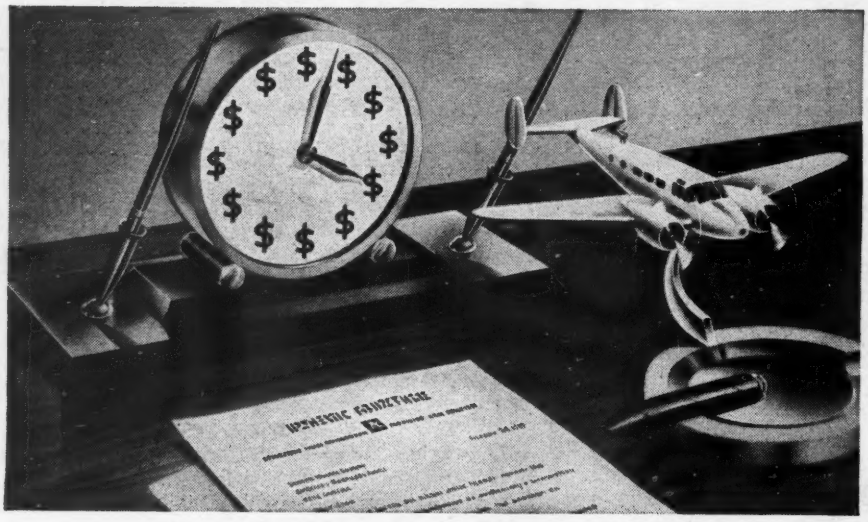
VITAMINS

Effect of Storage on Vitamins in Pork

FRESH pork retains its vitamins to a high degree when stored at 36 to 40 deg. F. Pork loins held at this temperature for 68 days retained 97 percent of the initial thiamin content, 94 percent of the riboflavin, 78 percent of the niacin, and 110 percent of the pantothenic acid, even though the loins were inedible because "sour," moldy or soft after storage for such a long period.

With ground pork however, there was a gradual decrease in thiamin during a 56-day storage period to 89 percent of the initial value. Niacin remained relatively constant, but riboflavin and pantothenic acid increased to over 150

When time is money NOTHING is as cheap as AIR EXPRESS



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percent, probably due to synthesis by bacteria.

At room temperature ground pork quickly putrefies. Thiamin decreases gradually to 47 percent of its initial value, niacin remains relatively constant, and riboflavin and pantathenic acid increase as much as 177 to 270 percent.

Both loins, and ground pork cured with a nitrite-nitrate glucose formula, kept much better with smaller changes in vitamin content than uncured pork. For all practical purposes the vitamin content of fresh pork remains unchanged during storage up to a point at which spoilage is noticeable.

Digest from "Storage and Microbial Action upon Vitamins of the B-Complex in Pork," by E. E. Rice. J. E. Fried, and W. R. Hess, *Food Research* vol. 11, 305-11, July-August, 1946.

Ascorbic Acid in Canned Citrus Juices

RETENTION of ascorbic acid in grapefruit and orange juices during canning operations, and after storage for various periods of time at 70 deg. F., was investigated at canneries representing the bulk of the citrus pack of California and Arizona. During canning operations the average retention was 98 percent for both products, but it varied from 91.6 to 107.5 percent for grapefruit juice and from 94.4 to 101.6 percent for orange juice. During storage at 70 deg. F. for 18 months, grapefruit juice lost ascorbic acid at a constant rate of about one percent a month. Orange juice lost more rapidly during the first few months of storage and less rapidly in later months, so that the average monthly rate of loss at the end of 12 months was about one percent. Detailed analytical results are tabulated, including Brix, and iron and copper content of juices. Canning, sampling, and analytical procedures are given, including tests for interfering substances in the determination of ascorbic acid.

Digest from "Nutritive Value of Canned Foods; Factors Affecting Ascorbic Acid Content of Canned Grapefruit and Orange Juices," by F. C. Lamb, *Industrial and Engineering Chemistry*, vol. 38, 860-864, August, 1946.

Ascorbic Acid Stability in Evaporated Milk

DISAPPEARANCE of ascorbic acid in evaporated milk after 4 months of storage, is uniform and proportional to the amount present. During the last 12 months of a 28-month storage period, average losses were 14 percent among samples having dif-

(*Continued on page* 190)

more "NUTRITION APPEAL"?

THE American mother depends on cereal, to a large extent, to give her children—and other members of her family —a nutritious start for the day.

She wants a cereal packed with all the food values she can get to help keep her family strong, healthy and energetic.

She is definitely "nutrition-minded," and the words "vitamin-fortified" and "enriched" are ones she looks for more and more often when she buys.

Manufacturers of cereals and other food products are aware of this trend — *and following it.* Those who have already fortified, have boosted the "sales appeal" of their products and made a genuine contribution to the national diet.

If you are considering ways and means of giving your food products more "nutrition appeal," perhaps Standard Brands can help you.

We have spent much time and research in recent years, developing products for vitamin B-complex, vitamin D and protein supplementation of foods. These products are known for their dependability and uniformity.

Whether you manufacture cereal, candy, baby food, corn meal, or other food products—we invite you to discuss your needs in confidence with one of our executives.

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Type 700-H

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Products containing

NATURAL B-COMPLEX FACTORS

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Pure Dry Primary Yeasts *(Brewer's Strain)*

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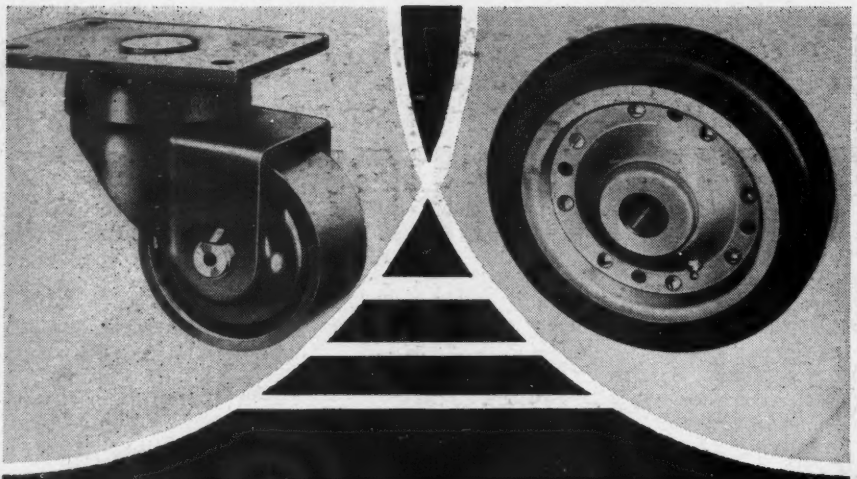

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ferent levels of ascorbic acid. Even in the first 4 months, the loss appears to be more closely related to the amount of ascorbic acid present than to the available oxygen.

The sodium salt of ascorbic acid is a satisfactory form of the vitamin to use for fortifying evaporated milk, inasmuch as it does not affect the stability of the proteins toward sterilization, and in all other respects behaves identically with the acid.

The authors conclude that evaporated milk is a suitable medium for fortification with ascorbic acid as the losses during storage are small and predictable.

Digest from "Additional Observations on the Stability of Ascorbic Acid and Sodium 1-Ascorbate in Evaporated Milk," by F. J. Doan and D. V. Josephson, *Journal of Dairy Science*, vol. 29, 625-628, September, 1946.

MICROBIOLOGY

Pathogenic Organisms in Dried Eggs

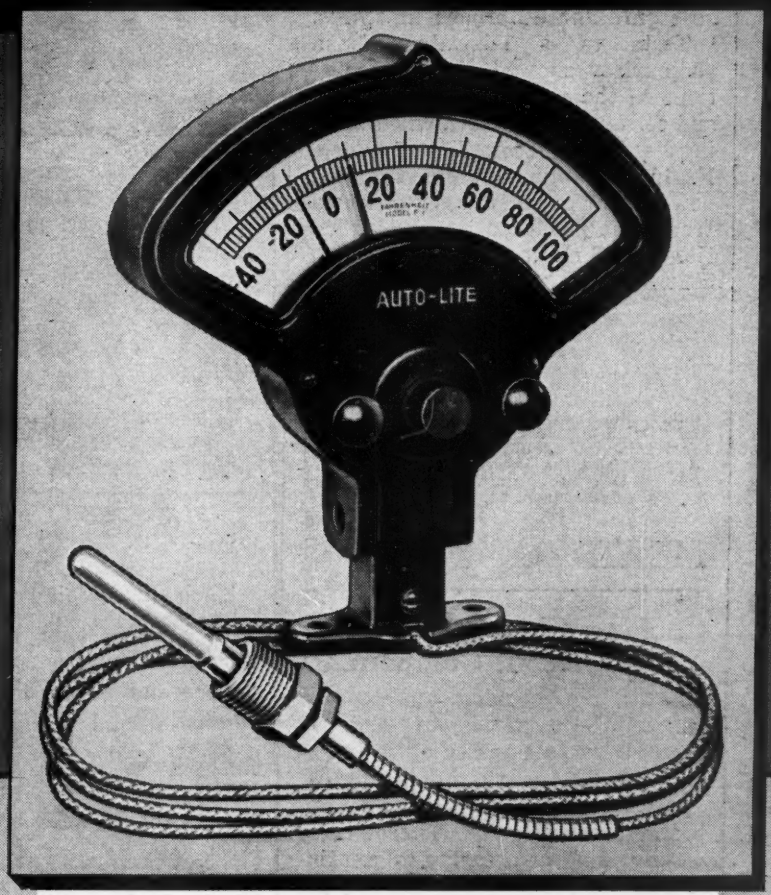
ORGANISMS pathogenic to man have been isolated from eggs and egg products frequently enough to demonstrate that, unless some care is used in drying eggs, dangerous species may survive. Thus Schneider found *Salmonella* species of five types in 32 out of 901 samples of high grade egg powder. From 797 lots spray-dried with preheating, *Salmonella* organisms were isolated in 13 or 1.63 percent, while from 104 lots, spray-dried without preheating, *Salmonella* was found in 19 or 18.27 percent.

Preheating of liquid eggs prior to drying has been found effective in reducing bacteria counts by 85 to 95 percent. Fresh liquid eggs can be heated to 150.8 deg. F. for 30 min. without coagulation if stirring is vigorous, and to 126 to 138 deg. F. for periods up to 12 hours. In commercial practice 140 deg. F. is the highest practical temperature before coagulation takes place on heating coils.

At 140 deg. F. the plate count of viable organisms reached a minimum and coliform organisms were killed in 30 minutes. At 135.5 deg. F. this was not accomplished for at least three hours. Holding at 140 deg. for 30 min. reduced the viable plate count by 98 to 99 percent, and destroyed coliforms, *Salmonella* and *Staphylococci*.

The egg powder resulting from the preheating treatment was not significantly different in quality from untreated controls. Fluorescence after storage for three weeks at 98.6 deg. F. was slightly less

RING THE BELL *on Temperature*



This vigilant Auto-Lite Indicating Thermometer has adjustable, electric alarm contact. Hook it up with a bell transformer circuit, and it gives a warning bell or light signal when processing or storage temperature rises above your desired level. Complete accuracy at all times is assured by Auto-Lite precision manufacturing. The flexible capillary tubing permits temperature readings to be made at convenient distance from temperature source. Large, legible dial simplifies observation. Engineered by Auto-Lite to avoid delicate parts, this rugged, dependable thermometer is especially useful on equipment where vibration is a factor. The same model is available also without the electric alarm contact.

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than controls. There was a somewhat greater tendency to pack in shipping containers and a slightly lower solubility. Palatability tests on scrambled eggs made from treated and untreated eggs showed no significant difference in scores.

Tests in a laboratory flash pasteurizer showed similar reductions in the number of total viable and coliform organisms, when heating liquid eggs from 72 to 140 deg. F. in one minute, and the egg powder was not materially different from that produced by pasteurization for 30 min., or from untreated controls.

Digest from "Investigation of *Salmonella* Content of Powdered Whole Egg With Not More Than Two Per Cent Moisture Content. II. General Survey on Occurrence of *Salmonella* in High-Quality Egg Powder," by M. D. Schneider, *Food Research*, vol. 11, No. 4, 313-317, July-August, 1946; and "Dried Whole Egg Powder XXI. Pasteurization of Liquid Egg and its Effect on Quality of the Powder," by N. E. Gibbons, C. O. Fulton, and M. Reid, *Canadian Journal of Research*, 24, 327-37, Sept. 1946.

MEATS

Cooking Changes Meat Components

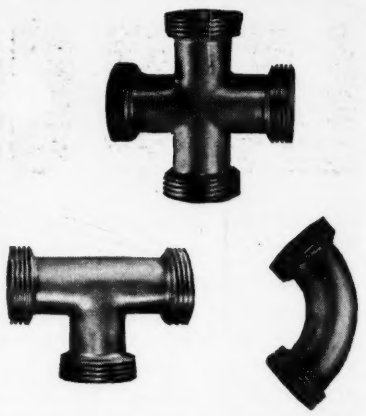
MEAT, during cooking, undergoes a characteristic series of changes that involve a number of the components. The change in texture and appearance is due mainly to coagulation of the proteins. There is also a conversion of creatine to creatinine and a shift in pH toward the alkaline side. At 212 deg. F. for one hour there is little change in the phosphate and non-coagulable nitrogen fractions of the meat proteins.

If cooked under pressure the meat undergoes further change, becomes softer, and the fibers are readily separated from one another. This change is due to production of gelatin from the collagen portion of the meat, a change which occurs at 212 deg. only on prolonged cooking, but which may become complete with pressure-cooking at 240 to 260 deg. F. If pressure cooking is prolonged the gelatin may be hydrolyzed to smaller units, possibly amino acids since some of them are dialyzable.

Flavor changes are associated with the non-protein nitrogen fraction, especially the simple peptides and amino acids. The hydrogen sulfide odor, and bitter flavors, which occurs during pressure cooking may arise from breakdown of cysteine. Bitter flavors may be related to creatinine formation since this compound is bitter, while its precursor creatine is not.

In raw meat, or meat cooked at

SANITARY STAINLESS STEEL FITTINGS



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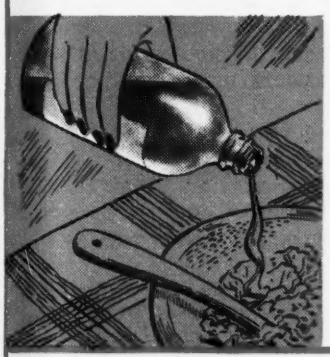
FOR SALAD AND COOKING OILS...

WOMEN PREFER GLASS CONTAINERS 4 TO 1

Housewives prefer a container that shows how much they have left!

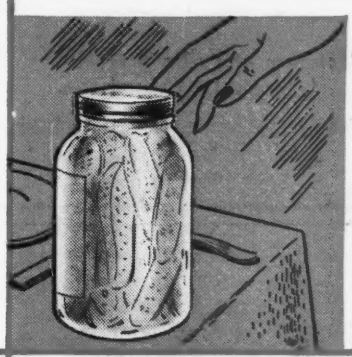
Their emphatic vote for salad and cooking oils in glass is but one example of sweeping preferences for glassed foods as indicated in national surveys of representative products* by a well-known public opinion analyst.**

The trend is to glass for modern packaging because of these basic glass advantages:



CONVENIENCE:

The time and work-saving advantages are largely responsible for such votes as the 4 to 1 preference for salad or cooking oil in glass. Easy to pour. Easy to clean. No waste.

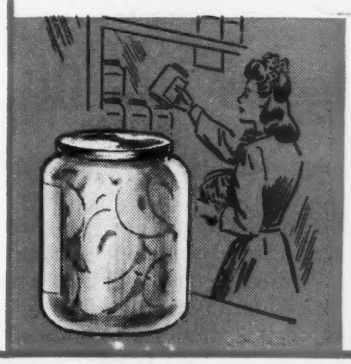


ATTRACTIVENESS:

Shiny glass containers are so attractive that many of them (for salad dressings, pickles, preserves, etc.) are placed right on the table.

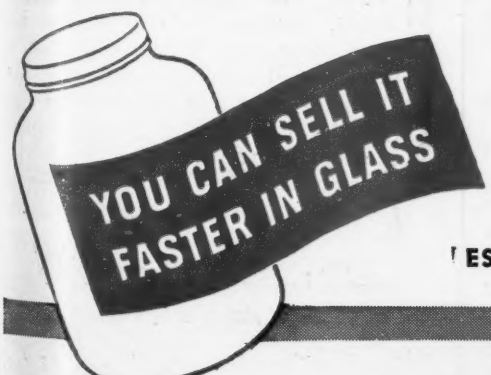
PROTECTION:

Coffee, for one example, is delivered at the peak of freshness, and the Ultra-Vac jar may be resealed after each use.



VISIBILITY:

A glass container invites product inspection. Color, amount and condition are on display. Luscious, glassed fruits catch the eye of a customer who is "looking for a delicious dessert"!



The popularity of glass containers is growing . . . growing because their many advantages are basic. You sell more—need less selling time with products packed in glass—in Duraglas Containers!

**Average is based on eight key classifications: pears, peaches, fruit salad and cocktail, baby food, coffee, salad or cooking oil, beets, food-beverages.*
***Name supplied on request.*

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completely atomizes and thoroughly burns . . .

the lowest and cheapest grades of fuel oil and tar; requires low oil pressure and temperature; operates continuously without cleaning or clogging. Internal atomizing feature uses steam or compressed air for atomization. Type "SA" Oil Burner is equally adaptable to all types of industrial heating, power or process furnaces. It is suitable for firing above stoker grade as alternate fuel.

FOR BURNING WASTE MATERIALS . . .

Type "S-A-D" Refuse Oil Burner operates with waste material pumped directly to the burner and blended with fuel oil in the venturi chamber; insures stability of ignition; reduces fumes and stack solids; uses steam or compressed air for atomization; functions entirely on fuel oil where supply of waste in intermittent; and assures continuous operation without cleaning or clogging.

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atmospheric pressure, 25 percent of the soluble phosphorus is present as hexose monophosphate. On pressure cooking total soluble phosphorus increases to about 110 percent of the raw meat value due to hydrolysis of phospho-protein and phospho-lipids. Esterified phosphorus decreases to about 10 percent of the total.

Digest from "The Effect of Cooking on the Creatine-Creatinine, Phosphorus, Nitrogen and pH Values of Raw Lean Beef," by J. R. Bendall, *Journal of the Society of Chemical Industry*, vol. 65, no. 8, 226-230, August, 1946.

DEHYDRATION

Factors in Palatability of Stored Egg Powders

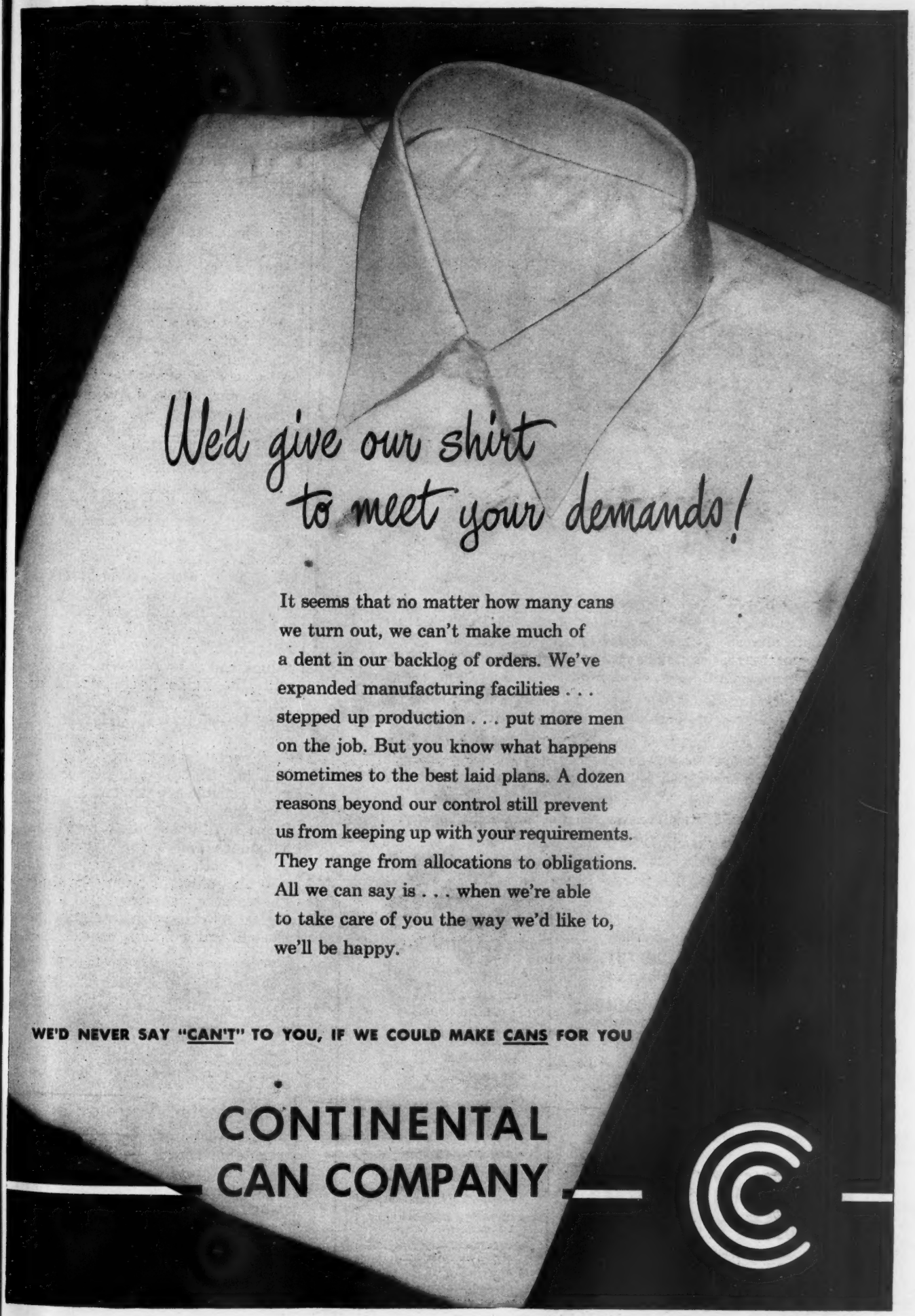
BY drying eggs from the frozen state (lyophilization) it is possible to obtain egg powders that reconstitute to pulp equal to the starting material in palatability, beating, solubility, and fluorescent criteria. When such powders are stored at —29.2 deg. F., no change in palatability occurs over long periods of time.

Using this experimental method, it was found that packing in nitrogen was superior to air packing, while CO_2 was superior to both air and nitrogen. The changes responsible for loss of palatability take place in the yolk, and retention of palatability is better if whites and yolks are stored separately.

The pH of whole eggs and yolks has an important bearing on the difference in keeping quality. Emulsified whole egg has a pH of about 8.5, while that of emulsified yolk is 5.5. When yolk was adjusted to pH 8.5 before drying it kept no better than whole egg of the same pH. Conversely, when whole eggs were adjusted to pH 5.5 by the addition of normal hydrochloric acid before drying, their palatability retention was equal to that of separately dried yolks.

When acidification to pH 5.6, and storage in nitrogen or CO_2 was tried, storage life (at 98 deg. F.) was more than four times that of unacidified egg powder in air. When reconstituting acidified egg powder, the pH must be returned to normal by the addition of sodium carbonate, or sodium carbonate can be added to the powdered egg before reconstituting.

Low temperatures and low moistures favor long shelf-life. Egg powders of 4.3 percent moisture deteriorated to the lower limit of palatability in two weeks at 98 deg. F., while a powder of less than one


We'd give our shirt
to meet your demands!
It seems that no matter how many cans we turn out, we can't make much of a dent in our backlog of orders. We've expanded manufacturing facilities . . . stepped up production . . . put more men on the job. But you know what happens sometimes to the best laid plans. A dozen reasons beyond our control still prevent us from keeping up with your requirements. They range from allocations to obligations. All we can say is . . . when we're able to take care of you the way we'd like to, we'll be happy.
WE'D NEVER SAY "CAN'T" TO YOU, IF WE COULD MAKE CANS FOR YOU
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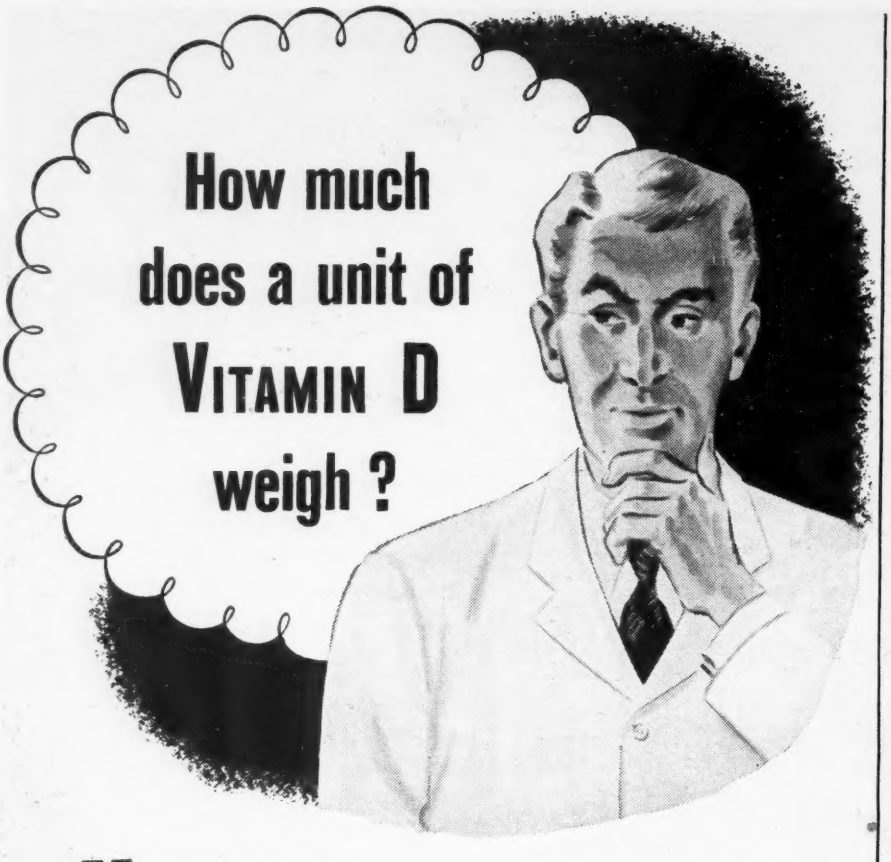

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Because this vitamin is in its pure state, gone are the other sterols which usually constitute a substantial portion of activated ergosterol.

Winthrop's pure crystalline vitamin D_2 (Calciferol) is free from lumisterol, tachysterol, toxisterol, suprasterol and other by-products of irradiation or electronic activation of ergosterol.

Calciferol is a uniform compound, with well defined physical and chemical characteristics. It never varies in antirachitic potency.

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Solution in Corn Oil: 1,000,000 U.S.P. Units per gram packed as follows:*
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**Standard Unit is 1,000,000 U.S.P. Units.*

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Calciferol is the name applicable only to the superior, pure crystalline product as so recognized and used throughout the world.

OTHER WINTHROP PURE SYNTHETIC VITAMINS:

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- **CALCIUM PANTOTHENATE**
- **VITAMIN C** (Ascorbic Acid)
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  Tryptophane — Cystine
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percent required eight weeks to reach the same level. Acidified lyophilized egg powder, packed in a CO_2 or nitrogen atmosphere and stored at 68 deg. F., would make acceptable scrambled eggs after two to three years.

By separation of the whites and yolks, and further separation of yolks into protein, lipovitellin, livetin, phospholipide, and phospholipide-free lipide fractions and storing them separately, the portion of the egg responsible for palatability deterioration was found to be the phospholipide fraction. The phospholipide-free lipides undergo rancidity changes when stored separately, but not in the presence of phospholipides. The latter apparently acts as an anti-oxidant for the former, but in doing so undergoes changes which account for characteristic off-flavors and off-odors of egg powders.

The salt-water fluorescence, often measured as a criterion of egg powder quality, arises from the egg white which contributes very little to loss of palatability during storage. Its reliability as a palatability criterion may therefore be questioned. Its value depends largely on the moisture content of the egg powder. When the correlation of salt-water fluorescence values and palatibility is compared with the lipide fluorescent-palatability correlation at different moisture levels, it is found that both correlate well for high moisture (4-5 percent) powders. The ether soluble (lipide) fluorescence is a more reliable criterion at low moisture contents (2 percent or less). Since the lipide-soluble fluorescing substance and the off-flavor component both seem to arise in the phospholipide fraction the lipide fluorescence measurement is a more logical criterion of palatability than the salt-water fluorescence.

Digest from "Dehydrated Egg Powders. Factors in Palatability of Stored Powders," by M. M. Boggs and H. L. Fevold, *ndustrial and Engineering Chemistry,* vol. 38, No. 10, 1075-79, Oct. 1946; "Sources of Off-Flavors Developed During Storage," by H. L. Fevold, B. G. Edwards, A. L. Dimick, and M. M. Boggs, *Ibid,* 1079-82; "Relation of Lipide and Salt-Water Fluorescence Values to Palatability," by M. M. Boggs, H. J. Dutton, B. G. Edwards, and H. L. Fevold, *Ibid.,* 1082-1084.

Dehydrated Vegetables

SLIGHT rehydration of a dehydrated vegetable product, such as onions, to facilitate its compression into brick form, is the feature of a patented product and process. Sliced onions, for example, are dried at a temperature of 130 to 140 deg. F., yielding a product containing about three percent moisture. It is then subjected at this temperature to

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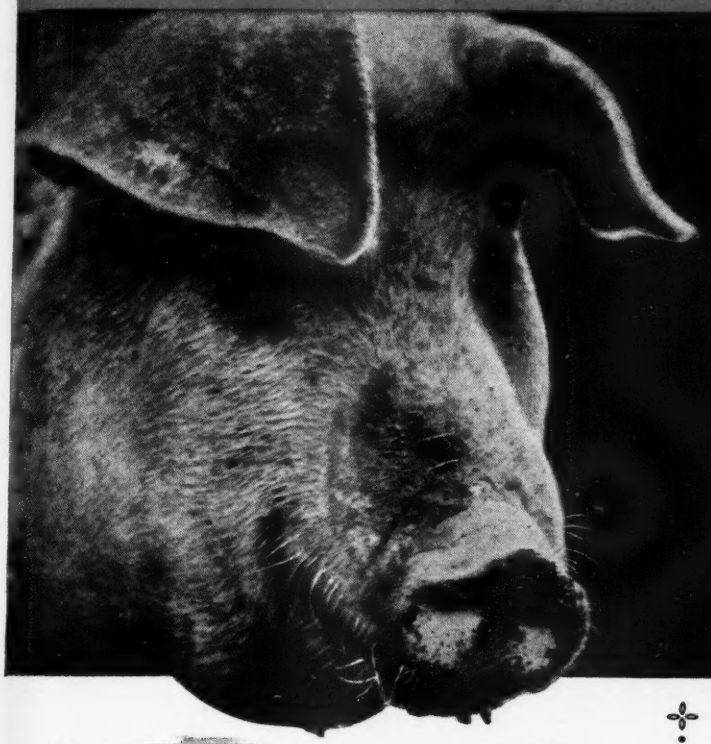
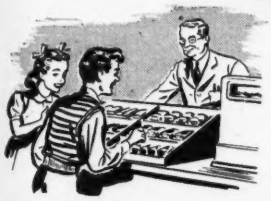


PIG!—from hock to jowl you are a galaxy of succulent pork cuts—each one greasy. Rhinelander has studied each part of your appetite-provoking body with respect to its proper packaging in G & G Task Papers.*



Good Candy packaging calls for: greaseproofness, transparency (or bright opacity), moisture control, heat sealing, non-sticking, printability, smooth machine handling, beauty and color. Rhinelander G & G Task Papers* offer *these* at low cost.

Mm!—What Fragrant Soap! Costly scents escape unless properly retained. Glassine, with the most dense formation of all papers, is almost impermeable to air-borne odor, is ideally suited to fine soap packaging.

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**Glassine and Greaseproof—the functional papers that do so many tough jobs well*

Metal foils have a great future in packaging. Rhinelander G & G Task Papers* multiply foil's usefulness. Our wax laminations reinforce pinholes—stop fractures. Our lacquers make these fine sheets heat sealing.

An accident! First aid to the rescue! Mother does a professional job with those clever, ready-for-use bandages. Their sterility is insured by Rhinelander G & G Task Papers* which protect hundreds of medical and pharmaceutical items.

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Steri-Chlor solutions are stable . . . you can use them without danger at high temperatures. This means efficiency in action and rapid drying of the surface where they are applied. And Steri-Chlor imparts no taste or odor to foodstuffs.

The use of Steri-Chlor with powdered soap for washing hands gives a high degree of sanitary protection. It is recommended wherever foods and beverages are handled, processed or dispensed.

Your Wyandotte Representative will be glad to tell you more about the advantages of Steri-Chlor. Give him a call at any time.

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humid air until additional moisture of from 0.2 to 0.4 percent is absorbed, or until total moisture carried by the product is from 3.2 to 3.5 percent by weight. While still at a temperature of, say, 125 to 140 deg. F., the onion pieces are compressed into bricks in a carton or package, sealed, and artificially cooled to atmospheric temperature. It is claimed that the process results in a brick in which the pieces adhere to each other, but automatically will separate into discrete units upon soaking.

Digest from U. S. Patent 2,406,431, issued August 27, 1946, on an application dated November 9, 1942, to M. W. Miller, Vacaville, Calif., and assigned to Basic Vegetable Products Co., Vacaville, Calif.

ASSAY METHODS

Tin Determinations

TIN determinations in food, by the volumetric iodometric method of the A.O.A.C., require a 50 to 100 g. sample. By application of polarographic methods 10 g. samples, with ⅛ the normal amount of acids for digestion and no hydrogen sulfide, can be run 3 to 4 times as fast.

A Heyrorský-type polarograph is used for the measurements, but a special anode vessel is necessary as stannic tin is reduced somewhat by the large mercury pool of the simple cell generally used. The special cell has a capillary base for receiving the dropping mercury and only a few tenths of a g. of mercury are used per determination. Connection to the calomel electrode is made by a potassium chloride bridge.

Before applying polarography to the digest of a food sample, the tin is separated by precipitation with ammonium hydroxide in the presence of aluminum chloride. The hydroxides precipitated in this way are easily centrifuged. Hydrochloric acid and ammonium chloride solutions of the hydroxides yield consistent, well-defined polarograms. The tin content of the samples can be determined by comparison of the height of the "steps" in the polarogram waves with those for standard tin solutions.

The method has been tried on whole and evaporated milk, grapefruit juice, prunes, apricot preserves, pork and beans, beets, mixed vegetables and vegetable juices, green and black-eyed peas, having tin contents from zero to 98 ppm.

Digest from "Polarographic Determination of Tin in Foods and Biological Materials," by E. M. Godar and O. R. Alexander, *Industrial and Engineering Chemistry*, Analytical Edition, vol. 18, no. 11, 681-84, Nov. 1946.

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BOOKS

British Index

INDEX TO THE LITERATURE OF FOOD INVESTIGATION, Vol. 16, No. 2, September, 1944. Compiled by Agnes Elizabeth Glennie and Diana Margaret Studdert Holmes. Distributed through the British Information Service, 30 Rockefeller Plaza, New York 20, N. Y. 6x9¼ in.; 161 pages; paper. Price, $1.35.

Here is another number in the war delayed appearance of this always welcome index. Although dated September, 1944, it did not appear until late 1946.

Frozen Foods

THE FREEZING PRESERVATION OF FOODS, Second Edition. By Donald K. Tressler and Clifford F. Evans. Published by The Avi Publishing Co., Inc., 31 Union Sq., New York 3, N. Y., 1947. 5½x8¼ in.; 932 pages; cloth. Price, $10.

The development of food freezing since publication of the original edition, in 1943, has caused the authors to rewrite parts of this volume and to add several new sections in order to keep the presentation up to date.

One of the most important of the new sections deals with the economic status of the industry. Another is devoted to the microbiology of frozen foods and plant sanitation. The freezing of cooked food is now covered also.

With frozen foods entering what many feel is to be its most difficult year, the appearance of this new edition is timely and should be helpful in getting some members over the transition hurdle. The price of the volume seems to indicate considerable confidence in the stability of the industry.

Save Vitamins

INFLUENCE OF COOKING PROCESSES ON FOOD NUTRIENTS. By Walter J. Peterson and Harriet B. Pressly. Published by the North Carolina Agricultural Experiment Station, Raleigh, N. C., January, 1946. 6x8¾ in.; 107 pages; paper. Free.

Prepared as part of the national cooperative project for the conservation of nutritive value in foods, this volume is a major contribution toward the publication of an annotated bibliography of each food commodity.

Indeed few foods seem to have been omitted from this comprehensive job, which entailed a search of the literature from January, 1934 to July 1, 1945. It should hold interest for the food technologist whether he happens to be engaged in the canning, freezing or drying of food and food products.

Vitamin Determination

PRACTICAL METHODS FOR THE MICROBIOLOGICAL ASSAY OF THE VITAMIN B COMPLEX AND ESSENTIAL AMINO ACIDS. By E. C. Barton-Wright. Published by Ashe Laboratories, Ltd., 120-122 Victoria St., London S. W. 1, England, 1946. 5½x8¼ in.; 58 pages; cloth. Price, 7/6d.

Because of the relative simplicity and speed of microbiological methods of assay, this little volume might be useful to the food chemist, whose work touches upon the Vitamin B complex and those amino acids included in this treatise.

Assays are of the six known members of the Vitamin B family, while tryptophan, leucine, isoleucine, cystine and valine, methionine, phenylalanine, lysine and histidine, arginine and threonine make up the selected amino acids.

Beer Making

THE PRACTICAL BREWER. By Edward H. Vogel, Jr., Frank H. Schwaiger, Henry G. Leonhardt and J. Adolf Merten. Published by the Master Brewers Association of America, 333 E. 41st St., New York, N. Y., 1946. 6x9 in.; 228 pages; cloth. Price, $2.50.

This treatise on brewing was prepared to familiarize the employees of the American brewing industry and the American public with the procedures and materials used in brewing beer. The treatment, therefore, has been as greatly simplified as possible, without becoming superficial. Where technical terms are employed, they are carefully explained so that the nontechnical reader will have little, if any, difficulty with the text.

The book's four authors have drawn upon their long experience in the practical operations of brewing to present this first volume of its kind. They cover the subject from raw materials to methods and instruments, pointing out along the way the pitfalls as well as the procedures to be practiced.

The United States Brewers Foundation has appropriated $25,000 to present a copy of the book to every public library in the country.

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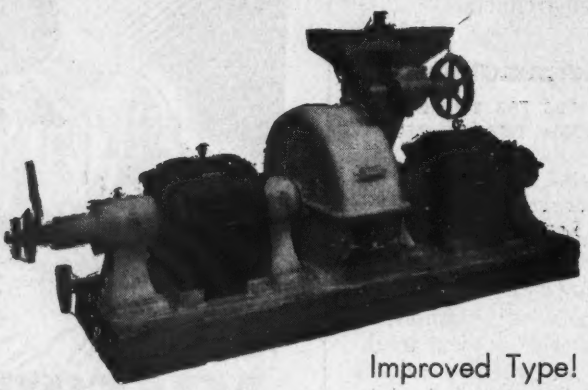

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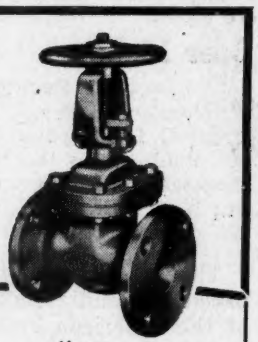

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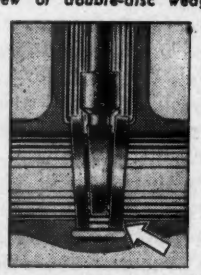
View of double-disc wedge



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GOVERNMENT PUBLICATIONS

The following recently issued documents are available, at the prices indicated, from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. When no price is indicated the pamphlet is free and should be ordered from the bureau responsible for its issue.

DDT AND OTHER INSECTICIDES AND REPELLENTS DEVELOPED FOR THE ARMED FORCES. Department of Agriculture, Miscellaneous Publication 606M. Price 20 cents.

THE SALT PROBLEM IN IRRIGATION AGRICULTURE. By H. E. Hayward and O. C. Magistad. Department of Agriculture, Miscellaneous Publication 607M. Price 5 cents.

RULES, POLICY, AND ACTS. Federal Trade Commission summary to guide those having official dealings with this Government agency. Price 25 cents.

STATISTICS AND MAPS FOR NATIONAL MARKET ANALYSIS (Basic Information Sources). Department of Commerce, Inquiry Reference Section. Mimeographed.

WORLD NUTRITION SITUATION. By Hazel K. Stiebeling. Department of Agriculture, Production and Marketing Administration. Mimeographed.

COMMITTEE ON FOOD RESEARCH—RESEARCH PROGRAM 1945-46. Quartermaster Corps Manual QMC 17-8. Available free on request to Quartermaster Food and Container Institute, 1849 West Pershing Road, Chicago 9, Illinois.

CONFERENCE ON FOOD ACCEPTANCE RESEARCH UNDER COMMITTEE ON FOOD RESEARCH, QUARTERMASTER CORPS. QMC 17-9. Resume of technical articles and discussion of December 1945 sessions. Available only from Quartermaster Food and Container Institute, 1849 West Pershing Road, Chicago 9, Illinois.

REGIONAL SHIFTS IN THE POSTWAR TRAFFIC OF CLASS I RAILWAYS. Interstate Commerce Commission, Statement No. 4622. A large mimeographed report and appendix, issued in two volumes.

WORKERS IN SUBJECTS PERTAINING TO AGRICULTURE IN LAND-GRANT COLLEGES AND EXPERIMENT STATIONS 1945-46. Department of Agriculture, Miscellaneous Publication No. 603. Price 25 cents.

PATENTS

DAIRY

Foam-Producing Agent Made From Skimmed Milk Containing Not More Than 0.05 to 0.1 Parts by Weight of Fat—Alexander S. Miner, New York, N. Y. No. 2,412,629. Dec. 17, 1946.

Mold Growth in Dairy Products Inhibited by Addition of Non-Toxic Water-Soluble Alkali Diacetate—Hans F. Bauer and Elmer F. Glabe, Chicago, Ill. to Stein, Hall & Co., Inc. No. 2,412,596. Dec. 17, 1946.

Powdered Milk Made to Contain Not More Than 2 Percent Moisture—Paul F. Sharp, Piedmont, Calif. to Golden State Co., Ltd., San Francisco, Calif. No. 2,412,635. Dec. 17, 1946.

Reconstituted Whole Milk Made From Frozen Whole Milk Concentrate Previously Heat-Treated to Pasteurizing Temperatures and Homogenized—Charles Brunkhurst, Middletown, N. Y. No. 2,412,203. Dec. 10, 1946.

ENGINEERING

Brine Prepared in Continuous Supply and Automatically Maintained at Saturated Concentrations—Frank L. Bolton, Ithaca, N. Y. No. 2,412,560. Dec. 17, 1946.

Confections Chocolate-Coated in Machine Equipped With Nozzle Controlled Air Blast—Allan Ashmead Tunley to Baker Perkins, Ltd., Peterborough, Northampton, England. No. 2,410,762. Nov. 5, 1946.

Eggs Mechanically Washed and Cleaned in Continuous Manner—Roy Stanley Davis, Otsego, Mich. No. 2,412,565. Dec. 17, 1946.

Fish Mechanically Conveyed, Positioned, and Held Fixed for Subsequent Mechanical Treatment—Charles M. Savrda, Bay Shore, N. Y. to Atlantic Coast Fisheries Co., New York, N. Y. No. 2,413,383. Dec. 31, 1946.

Fresh Fruit Coated With Solution of Waxy Material in Volatile Petroleum Distillate Solvent Immiscible With Water—Arthur F. Kalmar, Riverside, Calif. to Food Machinery Corp., San Jose, Calif. No. 2,412,686. Dec. 17, 1946.

Hamburger Patties Made in Continuous Manner—Harry H. Holly to Holly Molding Devices, Chicago, Ill. No. 2,413,046. Dec. 24, 1946.

Shredded Coconut Dried in Continuous Manner During Passage Through Chamber in Contact With Circulating Drying Medium—Louis H. Zeun, to Peter Paul, Inc., Naugatuck, Conn. No. 2,411,179. Nov. 19, 1946.

Vegetables Washed in Mechanical Unit Mounted Upon Water Tank—Alfred G. Suelflow, Milwaukee, Wis. (deceased); G. I. Hansen, (executor); to Felins Tying Machine Co., Milwaukee, Wis. No. 2,412,430. Dec. 10, 1946.

FATS AND OILS

Fats, Fatty Acids and Waxes Refined and Hydrogenated by Use of Small Percentage of Finely Divided Spent Catalyst Under Hydrogen Pressure of 50 to 750 Lb. Per Sq. In. at Slightly More Than 212 Deg. F.—Ilona Taussky, New York, N. Y. No. 2,413,009. Dec. 24, 1946.

PACKAGING

Crackers and Biscuits Packaged Into Cartons Automatically Formed and Filled—Eugene S. Tascher, Ingleside, Ill. and William Bazant, Wyandanch, N. Y. to National Biscuit Co., New York, N. Y. No. 2,412,370. Dec. 10, 1946.

Lettuce Packed to Inhibit Discoloration During Shipment in Ice—William H. Wilson to Fruit & Vegetable Processing Co., Los Angeles, Calif. No. 2,413,129. Dec. 24, 1946.

VITAMINS

Carotene Extracted From Wet Fresh Vegetable Carotene Concentrate by Heating With Edible Oil to Vaporize Water and Simultaneously Extract Carotene—Harold M. Barnett, Long Beach, Calif. No. 2,412,707. Dec. 17, 1946.

Fat-Soluble Vitamin Concentrates Made to be Rich in Vitamin Esters and Rich in Vitamin Alcohols—Loran O. Buxton, Newark, N. J. to National Oil Products Co., Harrison, N. J. No. 2,412,766. Dec. 17, 1946.

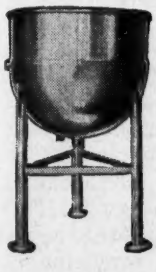
Improved Fat-Soluble Vitamin Concentrate Made From Fish Oil—Loran O. Buxton, East Orange, N. J. to National Oil Products Co., Harrison, N. J. No. 2,412,561. Dec. 17, 1946.

MISCELLANEOUS

Acyl Esters Made From Starch—Martinus Gerardus Groen, Hoogezand, Netherlands to Allied Property Custodian. No. 2,412,413. Dec. 10, 1946.

Gelatin Product Made to Contain Fumaric Acid as Ingredient—William Ernest Stokes, Garden City and Margaret H. Kennedy, Bronx, N. Y. to Standard Brands, Inc., New York, N. Y. No. 2,412,305. Dec. 10, 1946.

Grain Subjected to Accelerated Moisture Conditioning Preparatory to Milling Into Flour of Desired Moisture Content—Elizabeth J. Sullivan to Russell-Miller Milling Co., Minneapolis, Minn. No. 2,413,472. Dec. 31, 1946.



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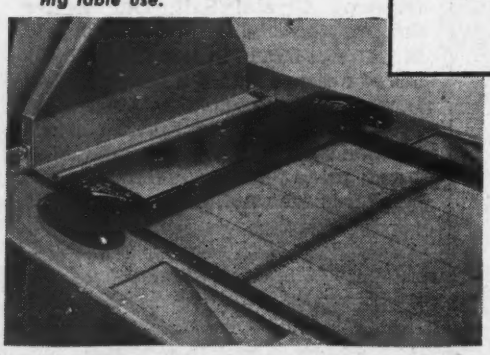

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Frozen Food Reports

FOOD INDUSTRIES will have reprints of its Frozen Food Reports available. The January and February parts of Frozen Food Report No. 2 will be offered as two separate reprints at $1.25 each for single copies (10 or more, $1.00 each).

Frozen Food Report No. 1, published in March, 1945, is also available, at the same price (single copies $1.25, 10 or more, $1.00 each).

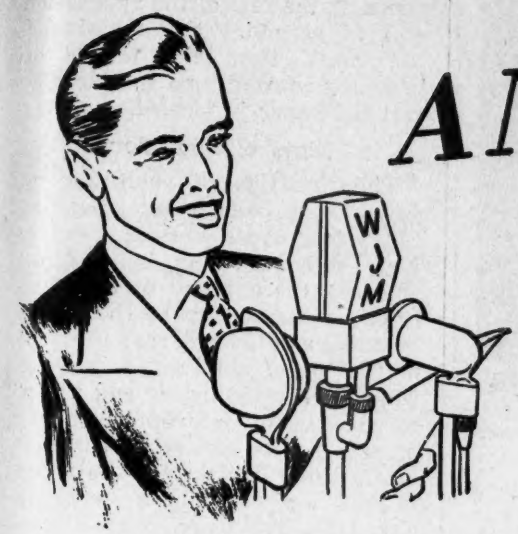
Sterilization

(*Continued from page* 102)

the evaporation here will be rapid and the pressure of the vapor in this region will lag but little behind the vapor tension of the water. Therefore, we may say that almost immediately after the water reaches 249.7 deg., the vapor at *B* will have reached 15 lb. gage pressure and forced the water down until its surface is level with that at *C*, viz. at level *MN*.

At this point, we may say that all three gages register 15 lb., if we neglect the effect of the head of water *H*, upon pressure. Thermometers T_1 and T_2, indicating respectively the temperatures to which containers *M* and *N* are subjected, will both register 249.7 deg. F., while thermometer T_1 will register a lower temperature that will depend upon the composition of the mixture of air and water vapor in compartment *D*.

Equilibrium having been established between water and its vapor at *B*, there will be further evaporation here only to the extent necessary to replace steam that condenses. Assuming the amount of condensation here to be slight, the evaporation will probably take place only from the surface of the water without the production of ebullition. At the time the temperature of the water reaches 249.7 deg. F., however, (about 6½ minutes after first application of heat), because of the time required for steam to diffuse through the air, the pressure in *D* of the water vapor which has passed off from the surface at *C* falls far short of being 29.715 lb. absolute. There is, therefore, far from an equilibrium condition between the water at surface *M* and its vapor in retort *D*. In an effort to establish equilibrium, water vapor will form at a rate that de-



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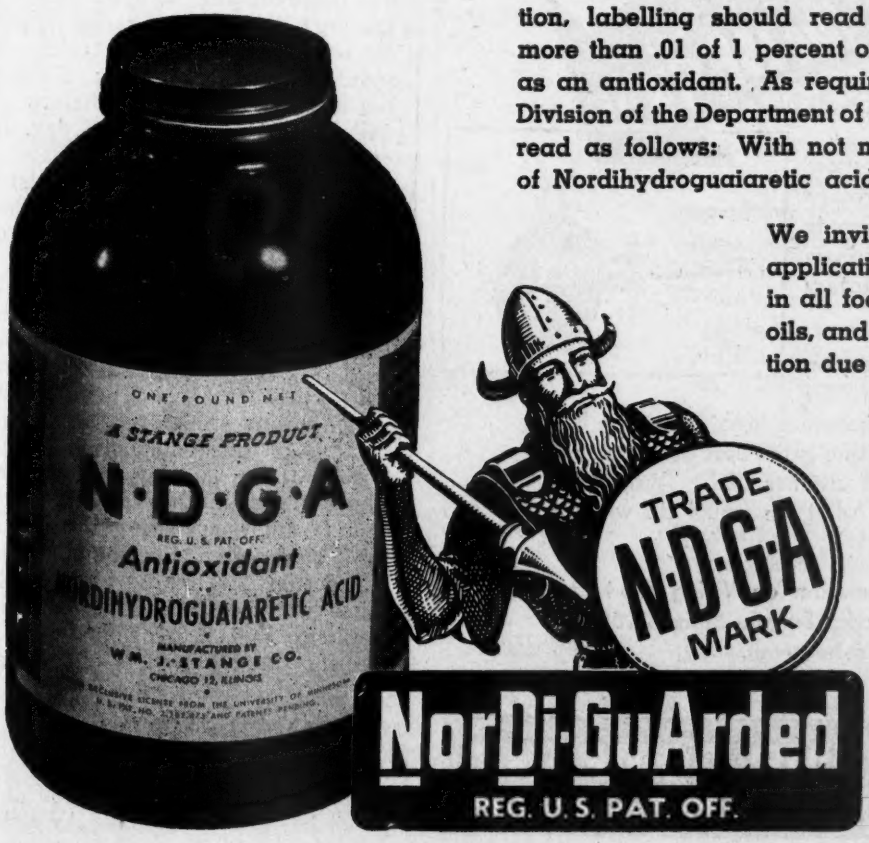

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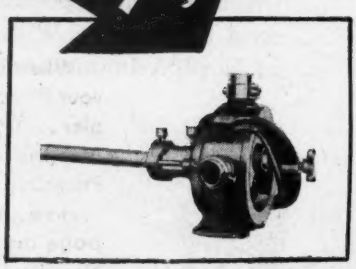

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pends on the rate of the application of heat, assuming that the size of the vent, V_1, is sufficient to hold the pressure constant, no matter how fast the vapor is formed.

State of Ebullition

The principle of ebullition requires that boiling take place as soon as the vapor pressure of water just exceeds (by an infinitesimal amount) the external pressure exerted on the surface of the water. In this case the external pressure is 29.715 lb. absolute, a part of which is exerted by air and a part by water vapor, or steam which may or may not be saturated (its condition being like that of the steam in the air pocket considered in Case III). The steam exerts a pressure equal only to the difference between the pressure exerted by the air present and the registered pressure of 29.715 lb. per square inch absolute.

To treat this condition rigidly, volume elements should be considered as was done in Case III, but this treatment does not seem necessary in this instance. It should be evident that, as soon as the vapor pressure of the water exceeds 29.715 by an infinitesimal amount, the water will boil up the tube C, the vigor of the boiling depending upon the amount of heat applied. Since the compartment D is of enormous size, the boiling will continue for a long time before all the air has been expelled through vent V_1. During all this time, gages G_1 and G_2 will register 15 lb. (plus an infinitesimal increment); G_3 will register 15 lb.; thermometers T_1 and T_2 will register 249.7 deg. F. (temperature surrounding containers M and N), and T_3 will register a temperature that approaches 249.7 deg. F. as the expulsion of air progresses.

If it should be said that this ebullition is not true boiling, the contrary may be proved by opening vent V_2, allowing steam from region B to escape. When this is done, boiling will take place in this section of the compartment, and surely there is only pure steam above the water here; certainly if this is not true boiling then there is no such thing. But the ebullition in Section A is taking place in the same water and at the same temperature and pressure as that in Section B. Therefore, they must both be the same kind of boiling.

It appears, therefore, that true boiling can take place in a retort from which not all of the air has been expelled. The condition that must be fulfilled in order that this

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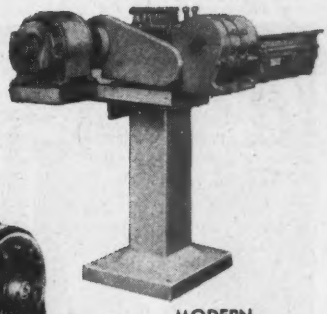

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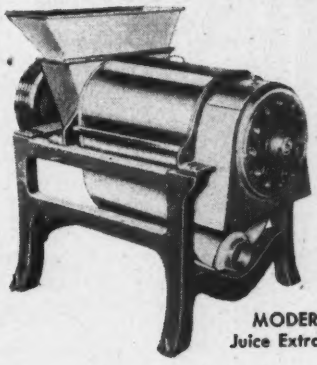
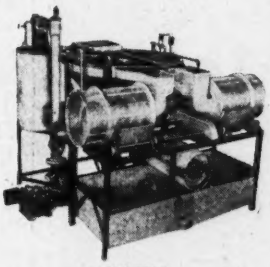


MODERN
Juice Extractor



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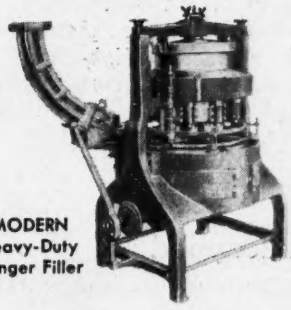

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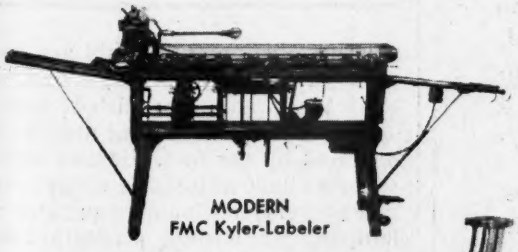

MODERN
FMC Kyler-Labeler

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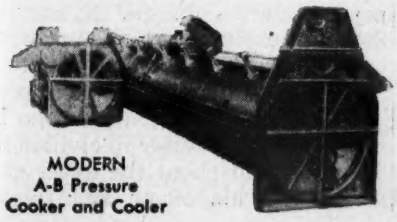
Hand Pack Filler



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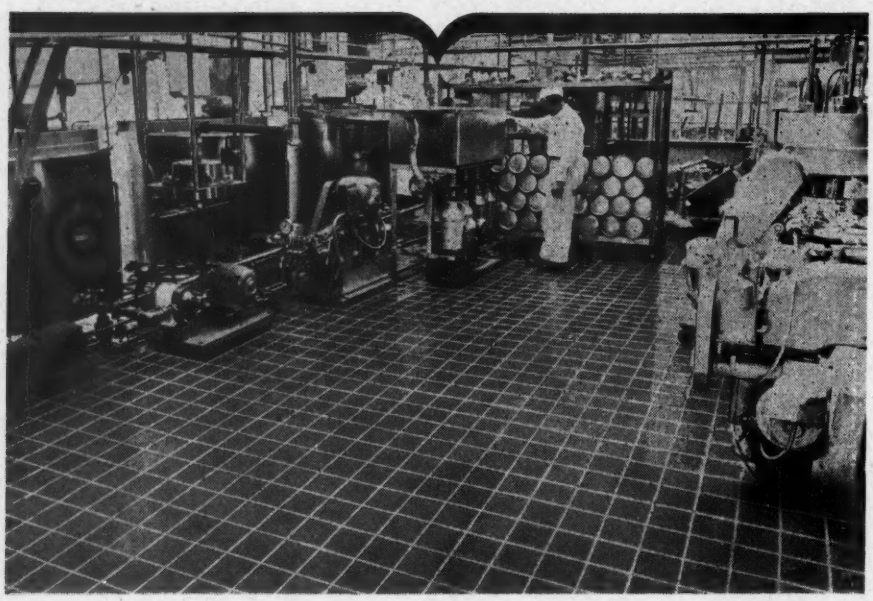

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may occur is that the heating of the water should be so rapid that, up to any instant, evaporation cannot take place fast enough to produce a vapor tension within the retort equal to the vapor pressure of the water at that instant.

When the pressure due to *water vapor alone* in *every part* of the retort equals the vapor pressure of the water at the same instant, there can be no air in the retort and still be an agreement between thermometer and pressure gage.

The foregoing theoretical discussion of the behavior of mixes of steam and air in transferring heat to containers of food provides a background for the explanation that is offered under Case IV of a characteristic of heating which is a cause of concern to workers in the field of process determination. This characteristic is manifested through an abrupt change in the rate of increase of temperature within a container of food where there is no apparent change in the procedure of applying heat to the container. A heat penetration curve in such a case is known as a broken heating curve.

Part III, to be published in March, discusses High-Short Sterilization, and the theory of the use of high frequency and dielectric heating.—The Editors.

—End—

Handicapped

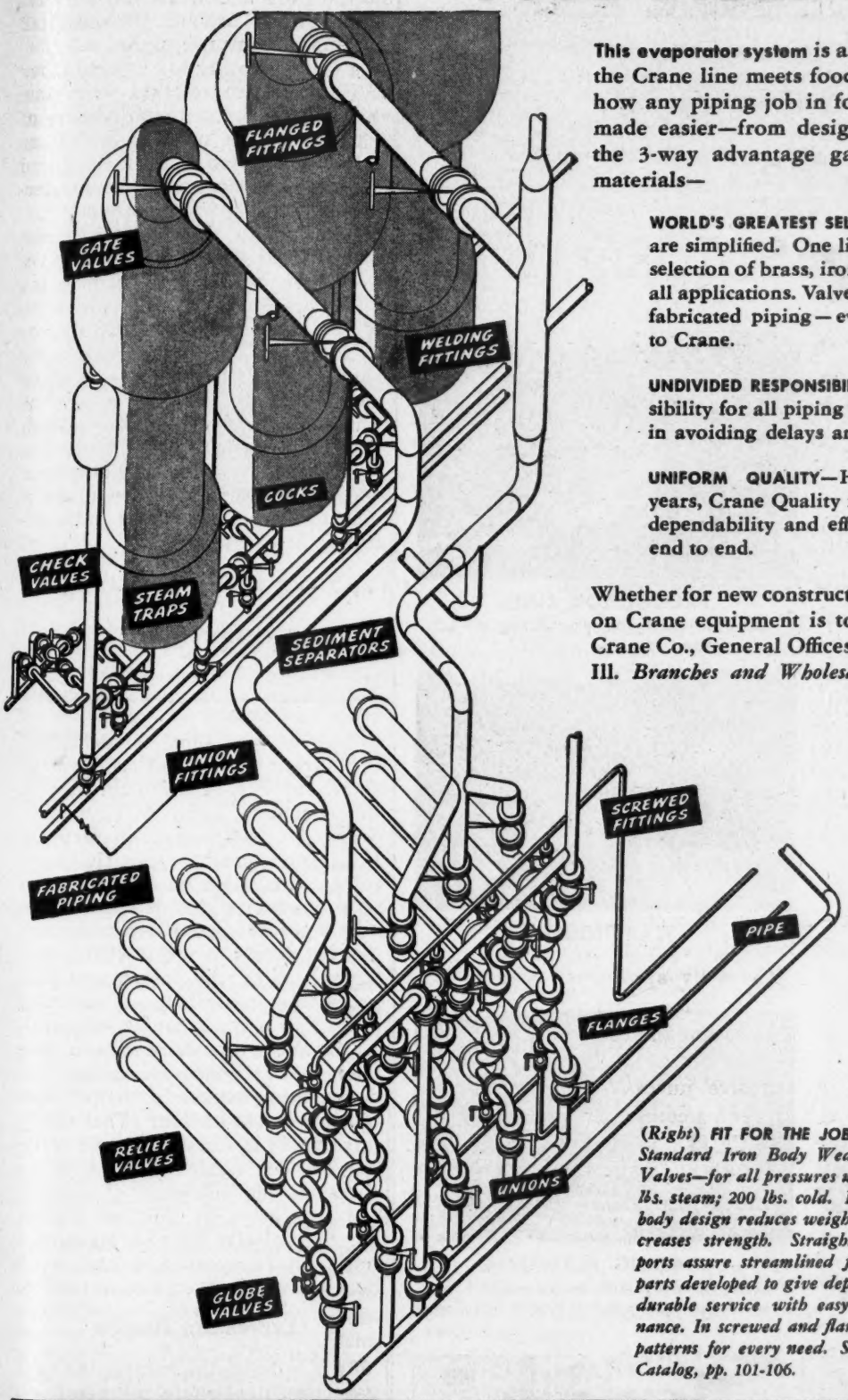
(*Continued from page* 97)

muscles. Different weights are applied to lathes, sanders, grinders and saws and are fitted upon devices similar to sewing machines operated by the feet. Devices such as looms have adjustable weights to give exercise to shoulders and finger muscles. If normal strength and use cannot be restored to the injured parts of the body, the patients are taught how to compensate for them as much as possible.

Special finger pulling devices are built as the first step in enabling a patient to regain the use of injured fingers. Then tools with graduated sizes of handles are used to permit greater use of the hands by stretching the tendons in the fingers.

It is not possible for the hospitals to have extensive shops, but equipment is available for the patients interested in following their previous careers. One patient who had been a spray painter in civilian life, was worried about the effect of an injury to his elbow and forearm

How to Speed and Simplify Food Plant Piping Jobs



This evaporator system is a typical example of how completely the Crane line meets food process piping needs. And here's how any piping job in food packing and canning plants is made easier—from design to erection to maintenance—by the 3-way advantage gained in standardizing on Crane materials—

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upon his ever being able to follow this line of work again. The hospital secured a spray and he practiced using it until he was able to do the work again. He did a lot of useful work around the hospital spraying furniture, walls and the like while treating his injured arm.

The men are released when the doctor and occupational therapist believe that as much recovery as possible has been gained.

Food manufacturing companies can be aided in their placement by checking with the hospital where occupational therapy treatments were given to the handicapped individual. By basing the placement of the individual upon the recommendation of the hospital and their knowledge of the man's interest in and ability to perform a job, at least two benefits can be gained. First the company will obtain the services of a much-needed employee and the employee will be given a job that he can perform satisfactorily.

—End—

Dissolved Oxygen

(Continued from page 107)

to secure a galvanometer deflection vs. percent air-saturation curve as shown in Fig. 4. Should any of the constants, such as electrodes, drop rate, instrument characteristics, galvanometer sensitivity or juice composition be changed, it is only necessary to determine the new 0 percent and 100 percent saturation points to reestablish a new curve. With the instrument and procedures described, an accuracy of ± two percent can be obtained.

The above procedure gives a simple, rapid and accurate method for determining oxygen in citrus juices as percent saturation. This figure is valuable where one sample is being checked against others, as in checking the efficiency of deaeration processes or routine control where a relative figure proportional to the total amount of air that could be dissolved in the juice is needed.

Expressing Results

If it is desired to express the oxygen concentration in ml. per liter, mg. per liter, or p.p.m., it is necessary to determine the volume of air dissolved per liter of juice at 0 deg. C. This value will vary with the amount of dissolved solids in the juice. For a grapefruit juice of 12 deg. Brix, it was found that 27.3 ml. of air dissolve per liter of juice.

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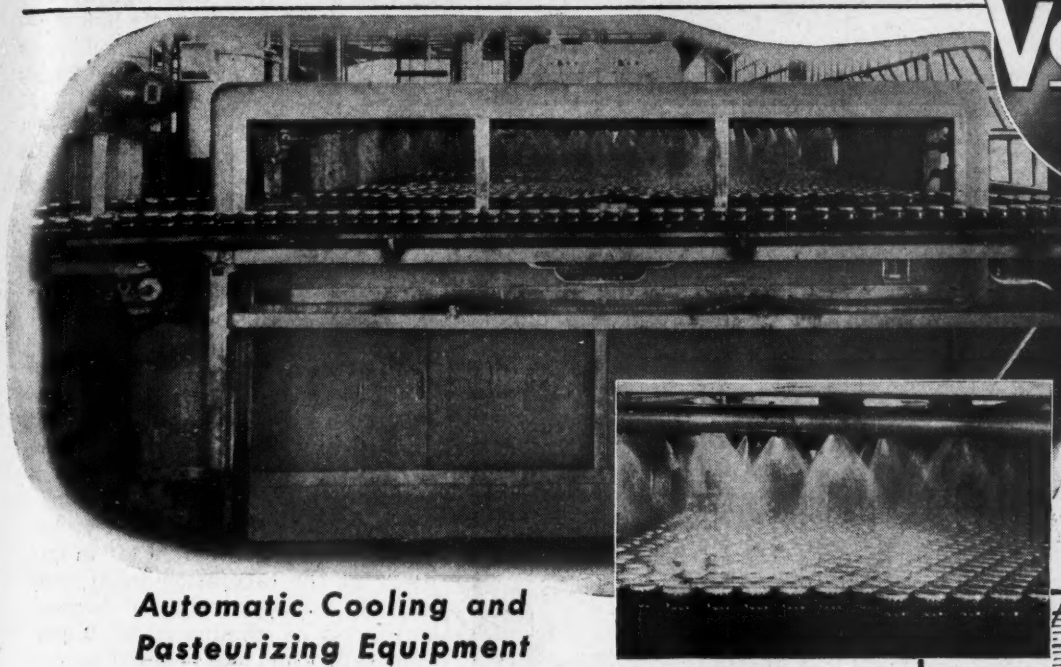
VORTEX



VORTEX cooler used by General Preserves, Inc., of Brooklyn, N. Y.

Automatic Cooling and Pasteurizing Equipment

Here is a brand-new machine to many processors for the heating or cooling of packaged food products within the temperature range of 32°—190° F. In its operation the VORTEX is completely automatic and can be run continuously with no operators required. The heat exchange medium is atomized water, distributed over the containers in such a manner that maximum heat transfer is achieved with a minimum quantity of water. Temperature zones are designed with careful attention to heat reclamation so that consumption of steam or refrigeration is as economical as possible.

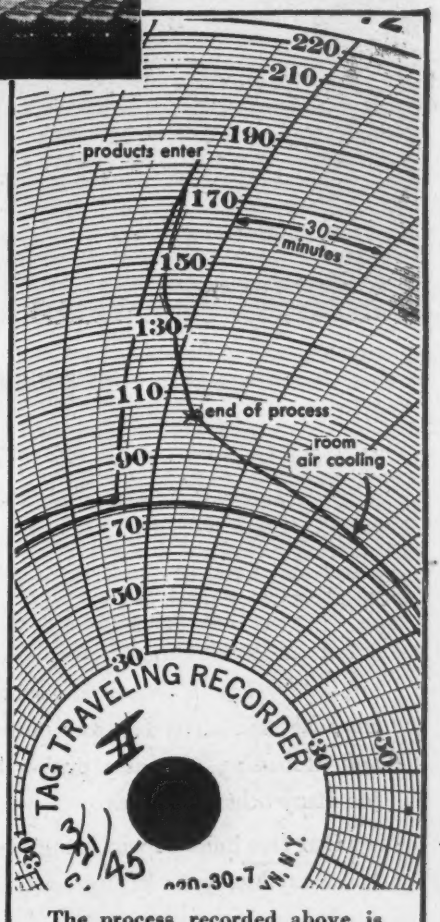
The capacity range is almost limitless. For example, at a total process time of 45 minutes machines have been built to handle from 75 to 450 bottles (2¾" dia.) per minute. Cans or bottles of all sizes may be handled automatically without mechanical adjustment. There is a wide range of standard sizes to select from which also makes the machine highly adaptable to your present floor plan arrangement. The conveyor is a patented version of the "walking beam" powered by hydraulic drive which assures stop-watch accuracy of process time and which permits infinite speed changes for varying process requirements. There is not a gear, cam, or chain on the machine, and the drive is almost entirely self-lubricating, which greatly simplifies the maintenance chores.

Great care was taken in the design to permit careful scrutiny of the spraying area at all times; portholes are spaced closely together along one length with waterproof lights on the opposite side to provide adequate illumination of packaged goods in process. Years of satisfaction are certain because of the durability of the design and the innumerable measures taken to eliminate the ravages of corrosion. On standard machines the "walking beam" conveyor, all spray headers, nozzles, and ducts are fabricated from copper and copper alloys; even the tank is formed from copper-bearing steel plate up to ½" thickness.

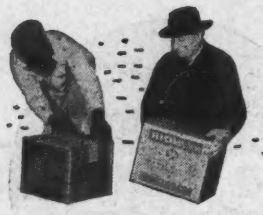
The VORTEX should be of particular interest to packers of the following products: jellies, jams, and preserves; catsup and tomato products; fruits and fruit juices; vegetables and vegetable juices; chocolate and table syrups; pickles and certain other products not requiring pressure cooking.

Automatic cooling of your products deserves scientific treatment to preserve the original flavors and clarity by positive control of time and temperature. Among the other most important advantages, the VORTEX will greatly conserve floor space and allow for immediate labeling and packing. When it is desired to produce a dry container to insure a satisfactory labeling condition, a rapid drying system can be supplied with the discharge conveyors which requires very little additional space.

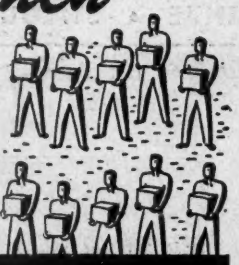
A new booklet is ready for distribution now which describes in detail the outstanding features of the VORTEX system and offers many helpful ideas on plant design as well. Whatever your problem may be within this field, it will pay you to learn our methods of securing uniform results. Write today, stating your process requirements, and ask for the new technical bulletin No. 87.



The process recorded above is cooling one pound hot orange marmalade jars 80° F. within twenty minutes to the desired packing temperature. With other types of foods it is often found that heating or cooling must be accomplished by graduating the temperature differential in separate steps, but in either case there is a standard VORTEX which fits your individual problem.



These 2 men



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Stevedore, Jr. is a power driven endless belt conveyor on an adjustable base. Stacks up to 6 feet at any angle. Portable — easily moved around. Plugs in any light socket. Carries up to 200 pounds of distributed load at 65 feet per minute. Used for stacking . . . loading and unloading . . . as a pusher in a gravity conveyor line . . . and for many other purposes.

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This was determined by placing 250 ml. of thoroughly deaerated juice in a closed system maintained at 0 deg. C. with approximately two liters of air. After thorough agitation, it was found that air had dissolved at the rate of 27.3 ml. per liter at 760 mm. pressure. This amount is less than the 29.18 ml. of air per liter reported for water[15], and is to be expected because dissolved substances lower the solubility of gases in liquids and the relative decrease in solubility is the same for different gases[16]. It was therefore assumed that the percentage of oxygen in the dissolved air is the same for water and grapefruit juice.

Published tables[15] give the figure 34.91 percent of dissolved air in water is oxygen at 0 deg. C. In the range where this method is most valuable (0 to 10 percent saturation), the determination for the total volume of dissolved air in any juice at the saturation point need only be an approximation because any error is eliminated at 0 percent saturation and reduced to one-tenth at 10 percent saturation. By using the values for a 12 deg. Brix (1.05 sp. gr.) grapefruit juice with 27.3 ml. of air per liter of juice of which 34.91 percent is oxygen, the percent saturation can readily be converted into any other desired units.

Summary

A simple, inexpensive and rapid polarographic method has been adapted for determining the amount of dissolved air or oxygen in fresh citrus juices. It has been particularly useful in studying the efficiency of deaeration. Ordinary sampling precautions are necessary for good results. In addition, it is imperative that time be allowed for the electrolysis cell to reach 0 deg. C. (about 15 minutes) and that the same dropping mercury electrode with the same drop rate be used in subsequent determinations as was used for the calibration curve. If these precautions are observed, reproducible results with an accuracy of ± two percent are readily obtained. The results are expressed as percent air saturation and by simple calculations can be expressed in any other desired units.

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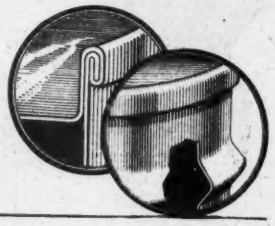

Section through lug type closure that is liquid-proof, airtight and sift-proof.

Protection bead on pails adds materially to its strength and utility.

Offset bottom, an important design feature of all Inland Steel Container pails permits containers to be stacked and rolled together.

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—End—

Material Standards

(*Continued from page* 89)

search put a finger on losses in machine peeling that were out of proportion. As a positive check, additional tests were conducted and these showed that while losses differed by varieties, all were much higher than had been suspected. As a result, other types of peelers were investigated and a new type was eventually installed. The saving was terrific—35¢ per 100 lb.

Continuing the search, it was discovered that a change in a twenty-year old procedure would eliminate a chronic bottleneck and cut the direct labor cost noticeably. How much, in dollars and cents, was problematical at the time; but not even the most optimistic material standards engineer was prepared for the final result—an additional annual saving that approached the six-figure mark! Unbelievable, but true, and again for only one raw material.

The same research applied to other processed ingredients brought equally satisfactory results. With only historical costs to beat, it was a comparatively simple matter for the material standards engineers to produce better yields, lower preparatory labor costs, establish defensible data on better equipment, and bring about a better co-ordination of production which actually improved quality. But the engineers were never satisfied and even today, though that company has saved millions of dollars through their efforts, the engineers are constantly pursuing their objective as though nothing had been accomplished to date.

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The 56 types of Du Pont transparent films are chemically tailored to provide the sanitary, moistureproof *protection* that meets the requirements of a wide variety of products.

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Silicone News

DC

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Photo courtesy Automatic Transportation Company.

It's human nature to want to beat the drums a bit when something you've put your sweat and capital into for years begins to pan out. We've been developing Silicone Insulation for years and giving silicone insulated motors the toughest testing electrical engineers could devise. We know it's the best electrical insulation there is. That confidence is now being justified.

Automatic Transportation Company of Chicago has announced that all of their new industrial trucks will be powered by DC Silicone insulated motors and lubricated with DC Silicone grease. That means a lot to us—and to you too. Engineers estimate that 20 to 50% of manufacturing costs goes into material handling. It costs you about $300, for example, to have a truck out of service while an armature is rewound.

Automatic Transportation is taking out insurance against such losses for you, by using Silicone Insulation. That kind of insurance is really necessary because there is no control over the kind of service industrial trucks get. They may have to lift 1,500 or 35,000 pounds. They may be used constantly or only part time. They may run over smooth floors or rough ones. A 2% grade doubles the torque on the motors.

That's why Automatic uses the best insulation there is. They put the best grease they can buy in the bearings. That's the DC 44 silicone grease, because it won't bleed into the windings or brushes. They also cushion the solenoid coils with Silastic*. Taken altogether, it's a nice example of how a conscientious, enterprising company can improve its product by using Dow Corning Silicones. These heat-stable, water-proof materials are described in Catalog No. O 1-4.

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Dow Corning
FIRST IN SILICONES

that could be cited. For example, the procedures followed and equipment used in processing the tomato could make the difference between a marginal operation and a highly profitable one. But neither procedure nor equipment has much significance on an engineer's report without detailed yield figures to back them up. Get the facts first and results will follow.

Processing poultry presents a very interesting study. His Highness, the Chicken, is used by many companies in soups, a la kings, and as boned meat. Here the size, sex, and grade of the bird are all important to the net prepared per pound cost. Furthermore, a close balance often must be maintained between fat and meat and the kettle and digester figures usually tell an interesting story.

Vendor controls on purchases of poultry are of prime importance. Most vendors are honest but one large canner found through material standards research that while it was paying a 100 percent price for frozen poultry, it was only getting a 95 percent bird. The difference—globules of water frozen inside the fowl. A $5,000 dead loss for every $100,000 spent over a period of years with that particular vendor!

By-Products

There is much to be gained through a study of by-products and waste salvage. Many companies have quite a waste disposal problem during the tomato season. Others simply dry out the waste, bag it up and sell it for feed, thus obtaining a revenue and solving a messy situation at the same time. Of course, additional equipment is required and perhaps for some canners it would not pay, but turn the material standards man loose on the problem first and let him come up with the answer.

In conclusion, let me say that if the aforementioned outline of material standards development looks formidable and complicated, rest assured that it is not. An orderly approach, once established, is half the battle and one or more imaginative engineers will take care of the balance. In addition it is necessary that the attitude of management be progressive and forward-looking. The cost? Well, take anticipated savings of 5 percent to as high as 15 percent and figure out what you can afford to spend on the development of material standards in your company. You will find the expense insignificant compared with the savings which will result.

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HODGMAN APRONS
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IRON BODY GLOBE or ANGLE VALVE

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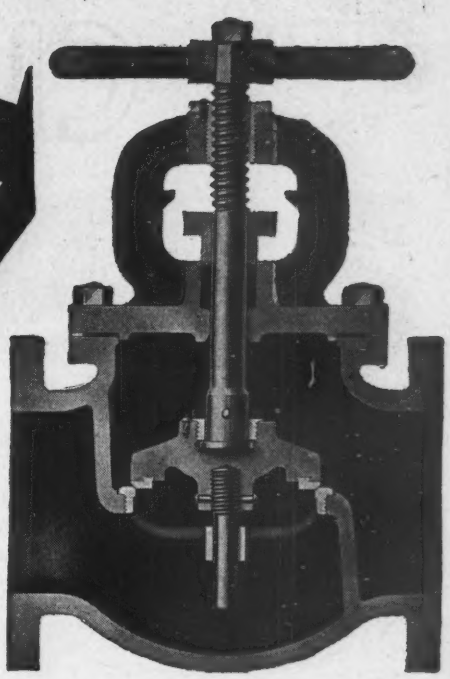

Notice the generous proportions, wide passageways with long curves, sturdy ribbed yoke with separate yoke nut, large handwheel, guided self-seating disc, renewable seat ring, and provisions for securely locking the disc, guide pin and yoke nut in place.

These are some of your assurances of extra strength and extra service when you install a Kennedy Iron Body Globe or Angle Valve. These valves are made in a full range of sizes for 125 lb., 150 lb., 175 lb. and 250 lb. steam pressure, with bronze-faced or renewable composition discs, and are also available in cross valve type. They are fully described in the 240-page Kennedy Catalog, which describes the entire Kennedy line of iron body and bronze gate, globe and check valves, malleable iron and bronze screwed pipe fittings, and cast iron flanged fittings and flanges. Write for your copy today.

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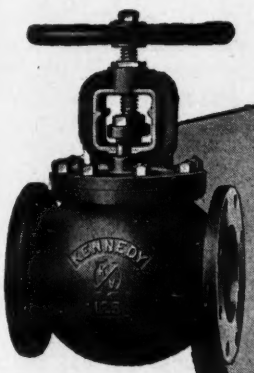

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. . . you'll find them in this KENNEDY design

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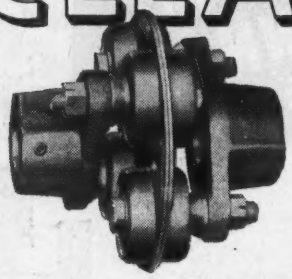

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FAST FLOW RATES
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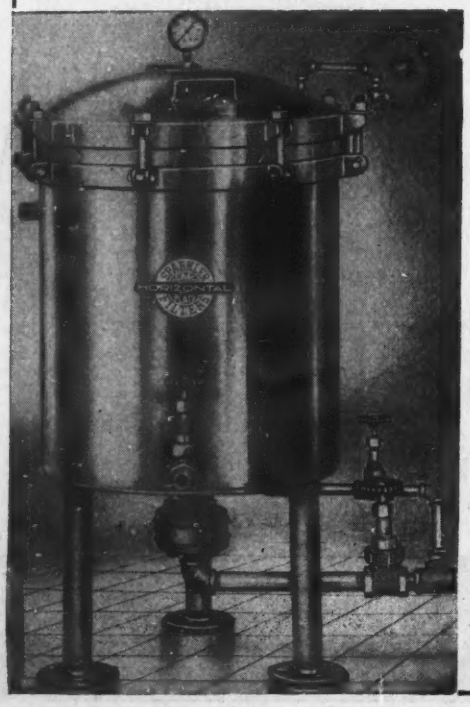

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Cake is stable even during intermittent operation.

HIGH QUALITY FILTRATE
Filters out even micro-sized particles.

Pressure-tight — Leakproof
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SPARKLER HORIZONTAL PLATE FILTERS

Model 18-D-12 STAINLESS STEEL
Capacity 1,200 G.P.H. on clear water

Laws and Verdicts

(*Continued from page* 116)

claimed that the public would be "misled" and "deceived" by labeling a product "Tomato Sauce," which contains less than that 8.37 percent of such solids.

This court agreed with the government and approved condemnation of the product on the grounds that it was mislabeled.

On the other hand, it is interesting to observe the ruling of a *Federal Court in United States* v. *55 Cases Popped Corn*, 62 Fed. Supp. 843, reported May, 1946. Here the higher court held that mineral oil could be used instead of melted butter or vegetable oil in preparing popcorn and prove the product is not an "adulterated food", within meaning of the Federal Food and Drug Act.

The trade and buying public have not adopted a "standard" that popcorn shall be prepared in butter or vegetable oils. Therefore, no implication arose that use of mineral oil is adulteration.

A Processor

In *Franklin Peanut Company* v. *Commissioner of Internal Revenue*, 144 Fed. (2d) 979, the higher court held that a person who cleans, grades, and sells peanuts and sells processed peanuts to wholesalers and jobbers, is a "processor" within the meaning of provisions of the Agricultural Adjustment Act imposing a processing tax.

Agricultural Employes — The laws of the United States and various States exempt farm labor, and agricultural employes, from Unemployment Compensation Laws, Social Security, etc. However, a modern higher court has held that employes, who work for a company that purchases crops, are *not* agricultural workers.

For illustration, in *Minor Walton Bean Company* v. *Michigan Unemployment Compensation Commission*, 14 N. W. (2d) 524, it was shown that a planter raised a field of beans. He sold same to a purchaser, who employed workers to clean them.

The legal question presented the court was whether these employes are exempt from the State's Unemployment Laws. In holding in negative, the higher court said:

"In the instance at bar, beans were purchased for the purpose of resale upon the purchaser complying with public regulations in culling, grading and fitting the same for market."